

*Richard Clark Esq.
Chamberlain of London.*

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Rare Book Room





PHOCÆNA,
OR THE
ANATOMY
OF A
PORPESS,
DISSECTED AT
Gresham Colledge:
WITH A
Præliminary Discourse concerning
Anatomy, and a Natural History of ANIMALS.

The World was made to be inhabited by Beasts, but studied and contemplated by Man: 'tis the Debt of our Reason we owe unto God, and the Homage we pay him for not being Beasts.

Religio Medici.

LONDON,
Printed for Beni. Tooke at the Ship in St. Paul's Church-

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T H E

Explication of the Figures.

Tabula I.

Figura I.

Here is given the lateral prospect of this Fish, drawn from the life, and more exact than those figures of Bellonius, Rondeletius, Jonston, Jo. Dan. Major, or any I have yet seen. We may here observe the shape of the Body, its Color and Spottings, the site and proportion of its Fins and Tayle, the Eyes, the Mouth, the Spiraculum or Spout, and at (a) the Rima of the Teats and at (bb) that of the Pudendum.

Fig. 2.

In the second figure is represented the Fish opened, and the Viscera of the Abdomen taken out.

AAAA. The Skin and Fat.

BB. The Os Hyoides which is mistaken by Dan. Major for the Os Sterni.

C. The Thymus.

d. The Sternum.

eeee. The Ribs.

f. The Diaphragme.

G G. On the left side are represented several tendinous fibres of the Musculus Psoas, and Diaphragme.

H. On the right side are shewn the curious Anastomoses of blood-vessels of the Membrane investing the Musculus Psoas.

Fig. 3.

In this figure is shewn the Tongue, the Larynx and Lungs.

A. The Tongue which is thick and serrated at the edges.

aa. Small Papillæ or Eminences at the root of the Tongue.

B. The Larynx which is very protuberating.

CC. The two Lobes of the Lungs.

D. The Gula or Oesophagus.

E. The Great Arterie, or Arteria Aorta.

Fig. 4.

Represents the Mouth of the Larynx opened.

a. The Rimula.

The Explication of the Figures.

Fig. 5.

This figure represents the Larynx and its several Cartilages more distinct.

A. The Cartilago Annularis or Cricoides.

B. The Cartilago Scutiformis or Thyroides.

CC. The Cartilago Arytainoides.

DDD. The Epiglottis.

Fig. 6.

In this figure the three Ventricles or Stomachs which are opened to shew their inward Tunics, as also the Pancreas, and part of the Omentum, are represented.

A. The inside of the first Stomach.

B. Several large Rugæ or Plicæ placed about the Passage from the first stomach to the second.

C. The second stomach.

D. The Passage out of the second stomach into the third.

EE. The third stomach.

f. The Pylorus.

g. Part of the Duodenum.

H. The Pancreas.

i. The entrance of the Ductus Pancreaticus.

K. One of those Glandulous bodies which is supposed to be the

L. Part of the Omentum fastened to the stomach.

m m m m. Large blood-vessels curiously ramified in the Omentum.

n n n. Curious small fibres filling up the Interstices of the blood-vessels, and rendering the whole structure of the Omentum reticular.

Tabula 2.

Fig. 1.

T*His figure does represent the several tendinous fibres of the Abdominal Muscles which running in various Manipuli, and being curiously interwoven, do make the Linea alba which is here very broad.*

Fig. 2.

Here is shewn the figure of the Liver.

A. That part which was in the right Hypochonder.

B. That in the left.

CC. The Ligamentum Suspensorium.

d. The Vena Umbilicalis.

Fig. 3.

The Glandule Renales, the Kidneys, Ureters and Bladder, and the various Organs of Generation

The Explication of the Figures!

ration belonging to the females, are delineated in this figure.

*A. The vena Cava.
BB. The Glandulæ Renales, or Capsulæ Atrabiles.*

CC. The two Kidneys, which consist of abundance of small Kidneys conglomerated together.

d d. The Ureters.

E E. The Bladder or Vesica Urinaria.

ff. The two Arteriæ Umbilicales.

G. The Pudendum.

h. The Clitoris according to Dan. Major.

i i. The two Teats.

K. The Anus.

L. The Uterus or Womb.

NN. The Cornua Uteri.

o o. The Tubi Fallopiiani.

P p. The Ovaria or Testiculi.

Q Q. Muscular fibres that run to the Cornua Uteri.

SSS. Numerous Ramifications of blood-vessels that run to the Cornua Uteri, the Ovaria, &c.

TT. The Alæ Uteri.

V V. Part of the Peritonium.

Fig. 4.

Represents a single Kidney or one of those Glands cut in two, one part hath a protuberance in the middle, the other a cavity or hollow.

Fig. 5.

Represents the inside of the Glandula Renalis, cut horizontally.

Fig. 6.

The figure of the Heart, almost in its natural bigness; wherein may be seen the division of the Cone, the Auricles, the Arteria Pulmonalis, Aorta, &c.

Fig. 7.

Is a delineation of part of those blond-vessels which compose that supposed Glandulous Body that lyes on each side the Spine in the Thorax or Breast.

Fig. 8.

Are represented various parts belonging to the Fistula or Spout on the head.

A. The slit in the Skin, or outward Orifice of the fistula, which in its natural site was placed over

BB. The foramina of the Nares.

CC. Two Valves or Protuberances of the skin which cover part of the foramina.

DD. The first pair of Bags.

E. The common passage into the first pair of bags.

FF. The second pair of bags.

GG. Two Glands contained within the second pair of bags.

Fig. 9.

Does only represent the figure of the Slit or Orifice of the fistula or spiraculum in the Skin and the first pair of bags.

A. The Slit or Orifice of the Spout or fistula.

BB. The first pair of bags.

Fig.

The Explication of the Figures.

Fig. 10.

The Explication of the Skeleton.

A. The upper Maxilla or Rostrum.

a a. The two holes of the fistula or Spout.

B. Several protuberances on the Os Frontis.

c c. Two pyramidal processes of two bones that compose part of the Spiraculum or Spout.

d. One of the outward bones of the Rostrum.

e. One of the inward bones of the Rostrum.

f. The os Zygomaticum.

g. A large eminence in the Cranium and the sutura Coronalis.

h. The sutura Lambdoidea.

i. The Teeth.

K. The lower Jaw.

m. The transverse process of the first vertebra of the neck call'd Atlas.

n. The Spinal process of the same Vertebra.

ooo. The Spinal processes of the other Vertebrae.

pp. Processes opposite to the Spinal processes consisting of two small bones, arising from the Cartilages that joyn the Vertebrae together.

Q. The Scapula. The bones of the fin are represented in the next figure.

rr. Two processes of the Scapula.

SSS. The Ribs.

T. The Sternum.

Fig. 11.

The Bones that compose the fore-fin are here delineated.

A. The os Humeri.

B. The Radius.

C. The Ulna.

dd. The Bones of the Carpus.

eee. The Bones of the Metacarpe.

fff. The Bones of the Digi.

Fig. 12.

Represents the Anterior part of the os Petrosum or Ear-bone.

a. The Hollow leading to the Tympanum.

B. The Tympanum.

C. That part of the Ear-bone that lyes in the Cranium.

D. That part which is without.

Fig. 13.

Represents the posterior part of the os Petrosum or Ear-bone which here seems to be two bones.

a a. That part of the Ear-bone that represents a Cochlea.

B. A Cavity for receiving the Auditory Nerve.

C. A large Hollow that leads into the Cavity of the Ear and seems to render it two bones.

dd. That part of the Ear-bone which is very thick and solid.



To the HONOURABLE

Sr. Joseph Williamson, Kt.

President of the Royal Society ; and to the Council, and Fellows of the said Society.

SIR,

THere is no man that hath the free use of his Reason and Senses, with Opportunity, but must as naturally fall to Philosophizing ; as a Silk-worm that is full grown, and hath a convenient place, must fall to Spinning. But one whom the Royal Society hath so far honoured and obliged, as to make him of their Number ; how much less possible is it for him to live a Drone, and not to act his part in so industrious and noble a Hive ? As a Specimen of what I am willing more particularly to apply my self to, I here humbly offer the following Discourse to your acceptance.

The Epistle Dedicatory.

And which I also do with some allowable boldness: Because upon a subject so suitable to your Design; because, I am sure, I have at least heartily aimed at my Duty in the management of it: and because it was first drawn up, and is now published, not without your own favourable Aspect and good liking. And if, upon your review, it shall again meet with the same, I shall not only be buoyed up against any ill Reflections that may befall it; but encourag'd to proceed in what I have begun: and to do all that one would do, who aspires to be in some measure useful, and

Sir,

One of

Your most Obedient
Servants,

Edw. Tyson.

Fig. 1.



Fig. 2.

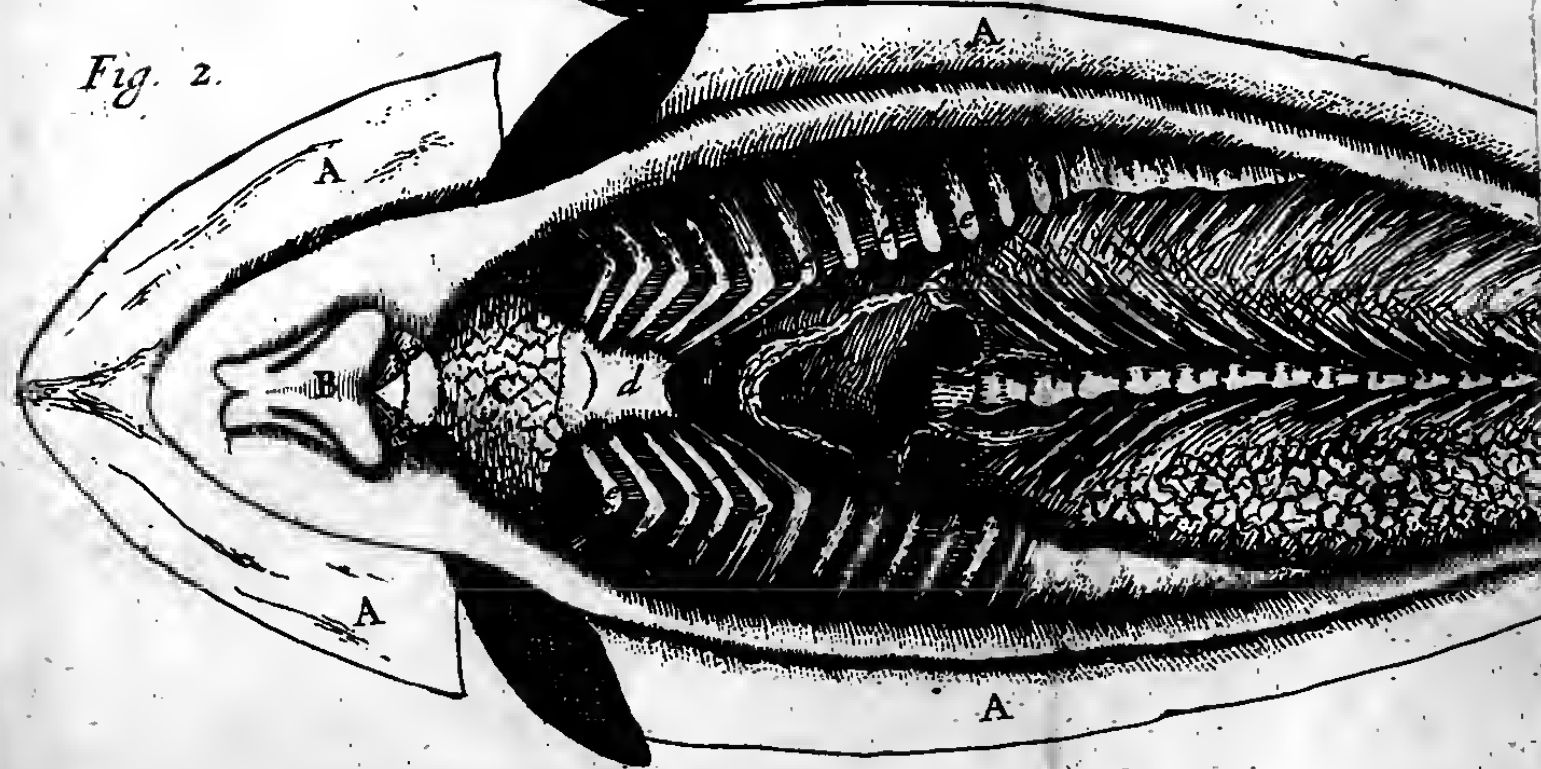


Fig. 3.

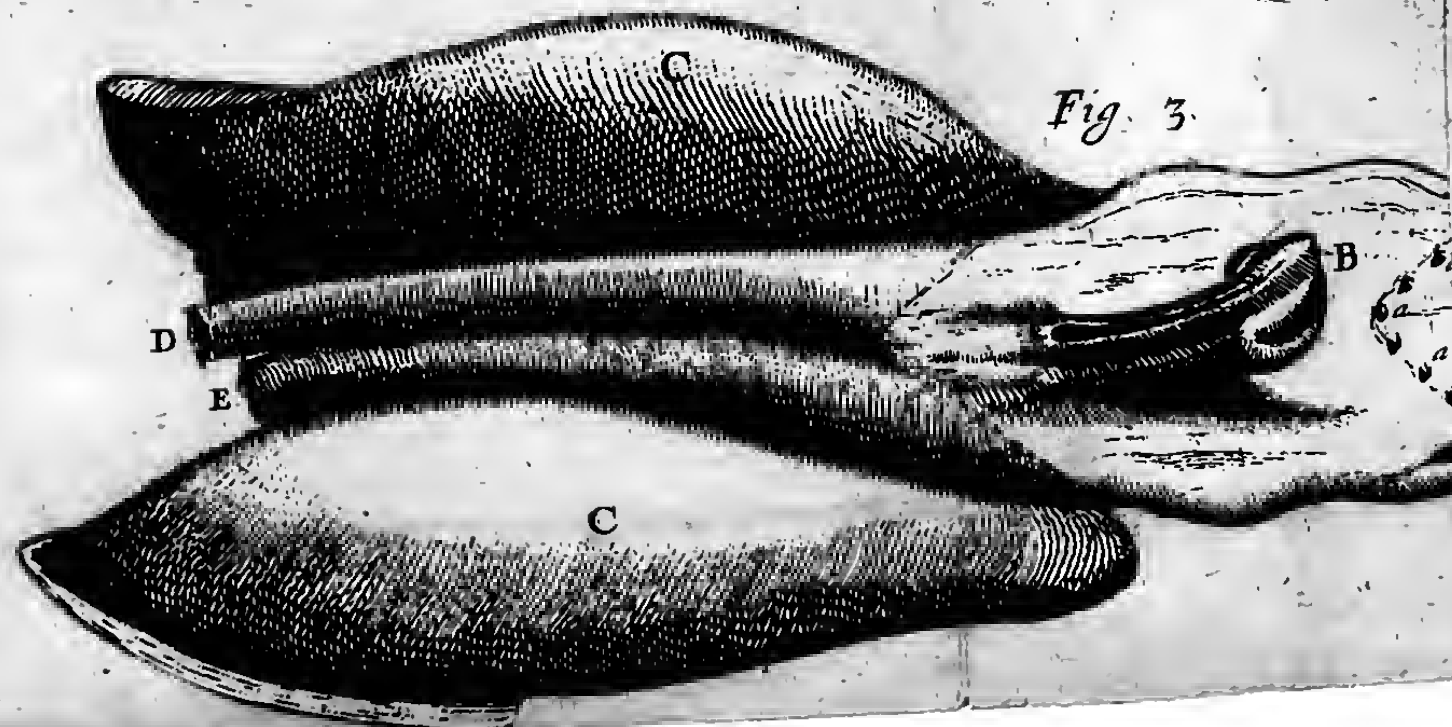


Fig. v.

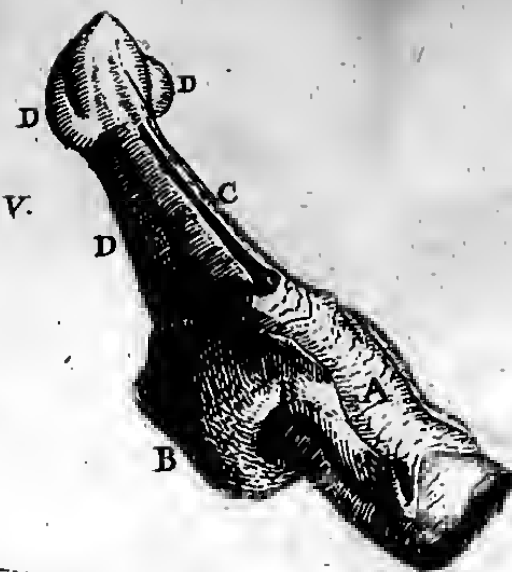


Fig. VI.

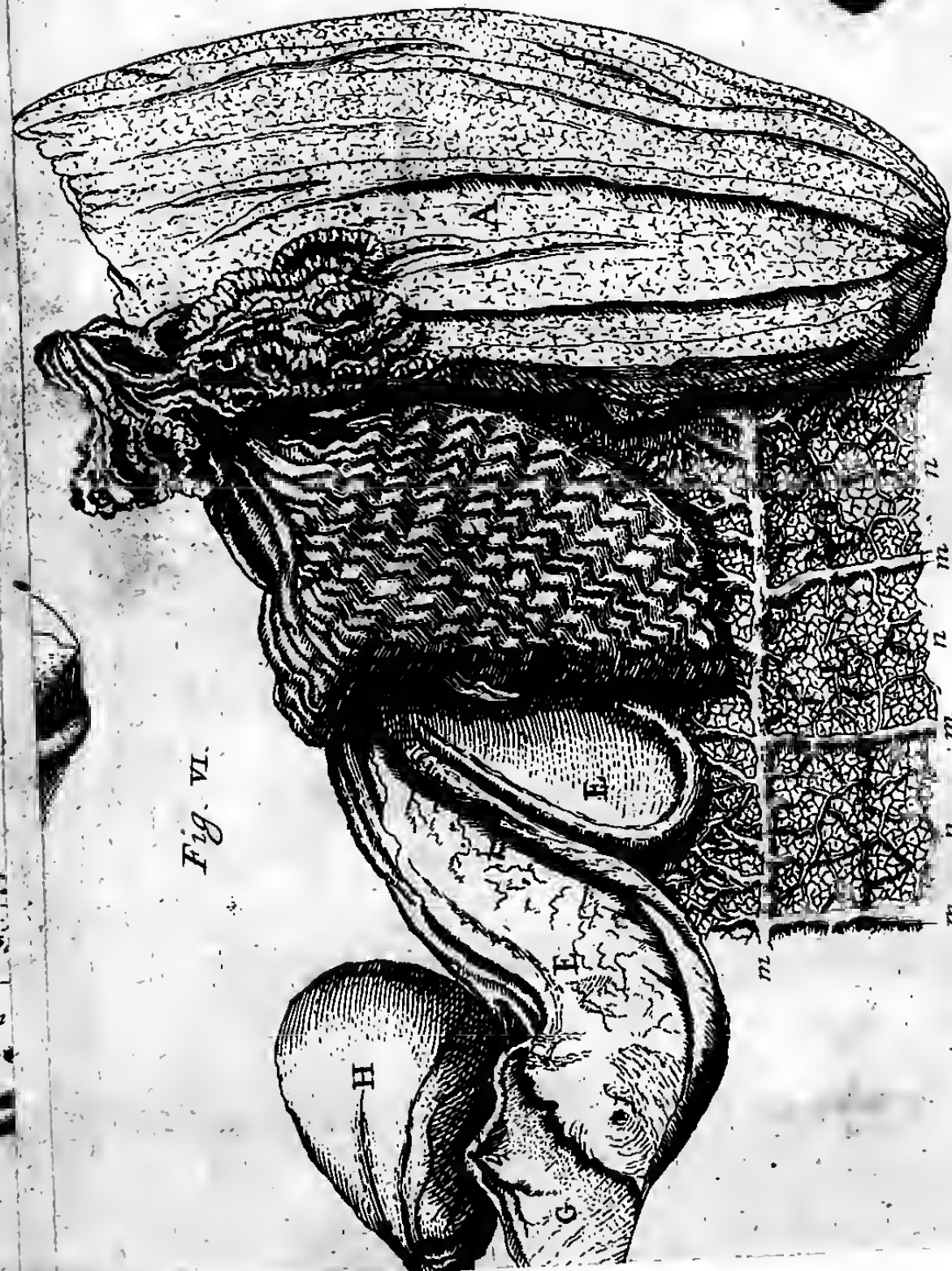




Fig. XII.

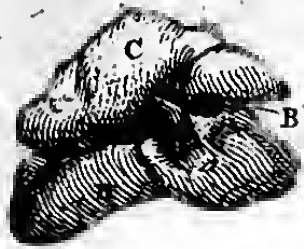


Fig. XIII.

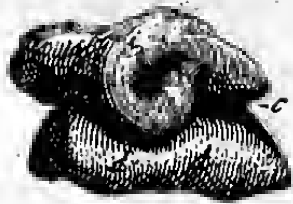


Fig. I.

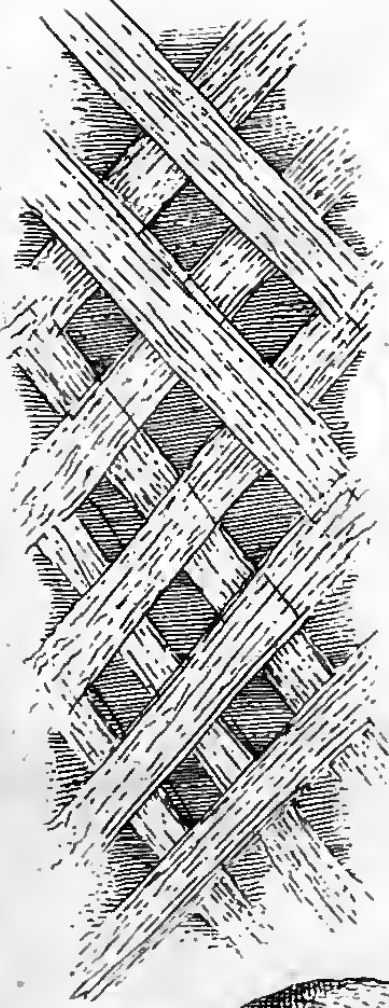


Fig. VI.

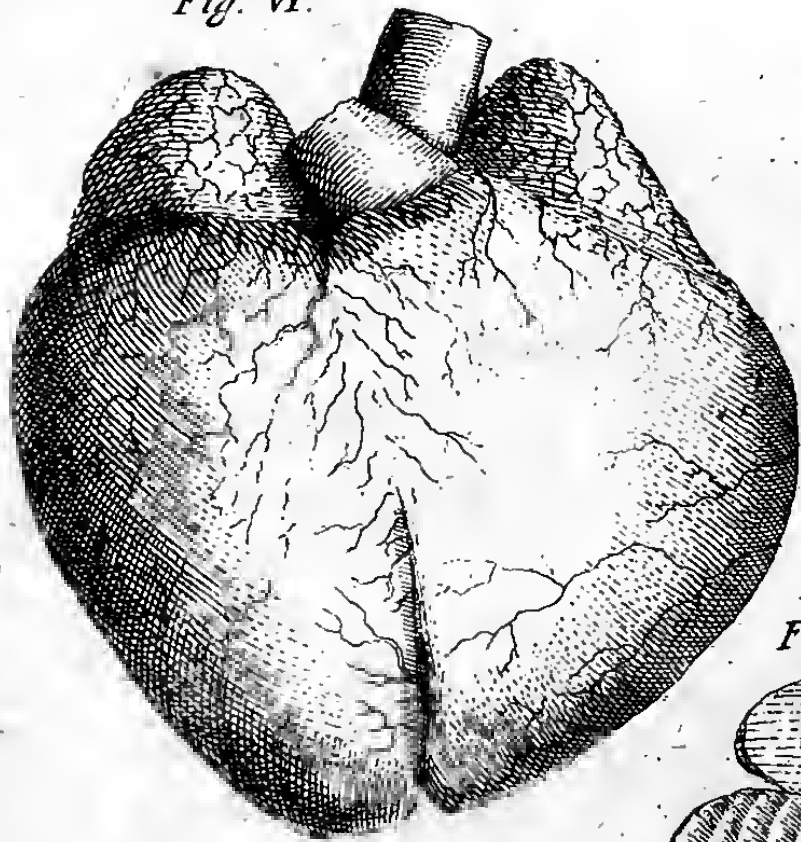


Fig. 2.

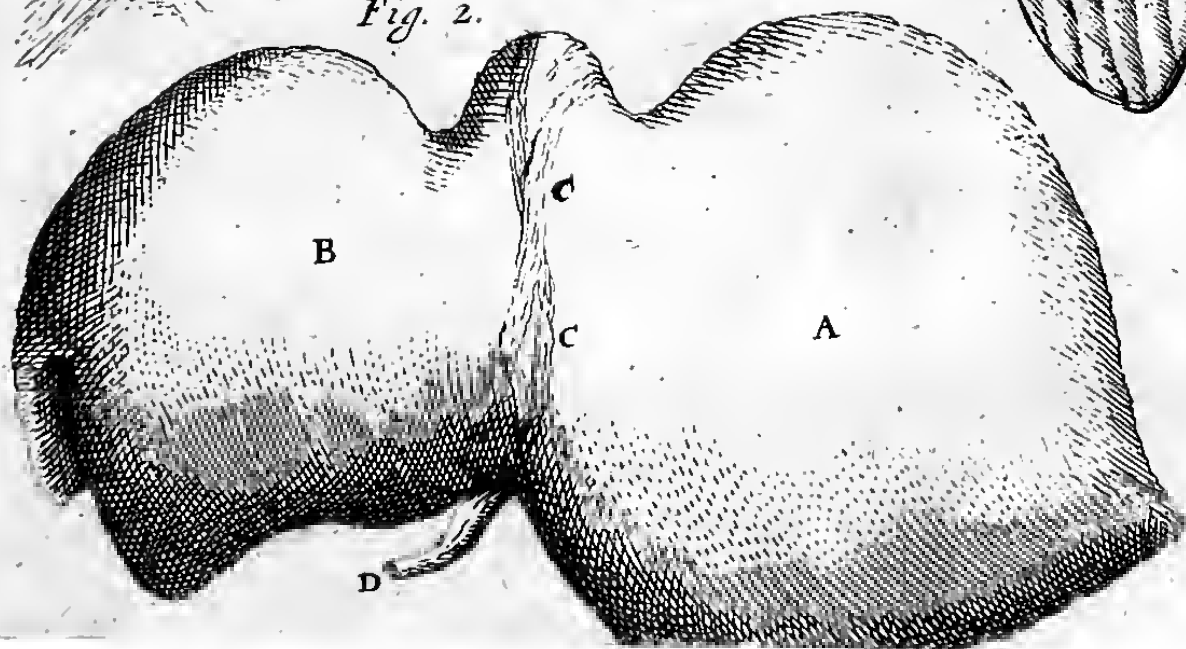


Fig. IX.

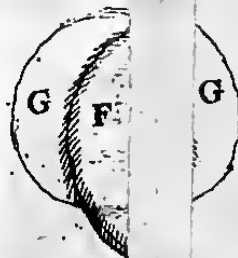
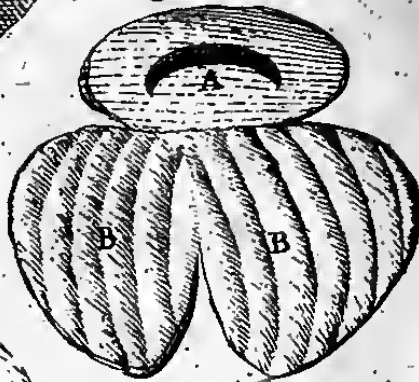


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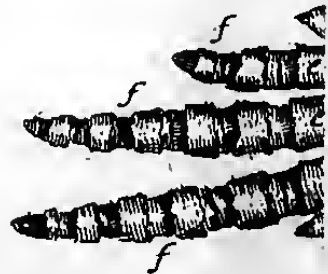


Fig. X.

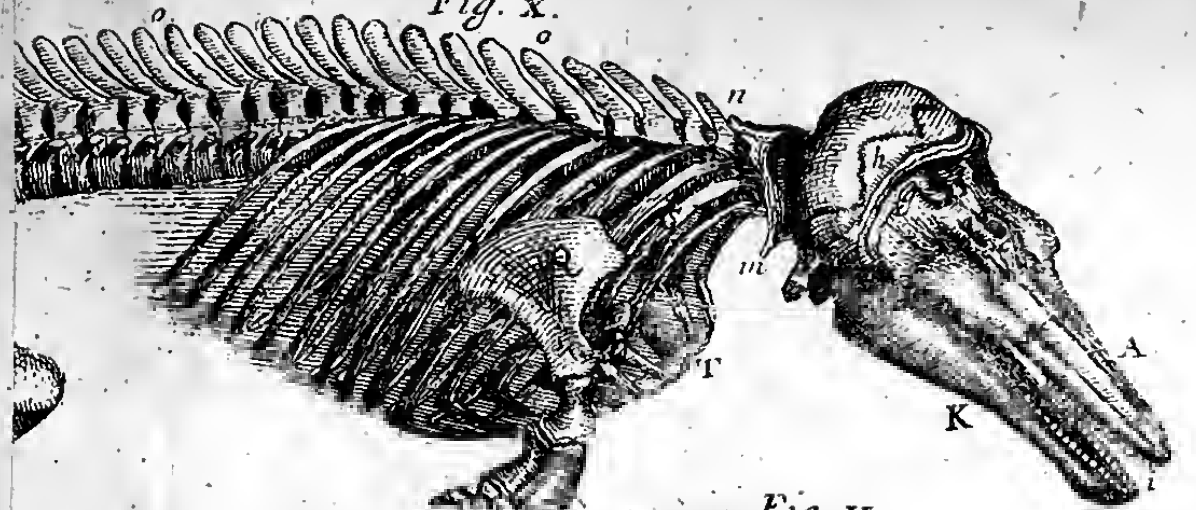


Fig. V.

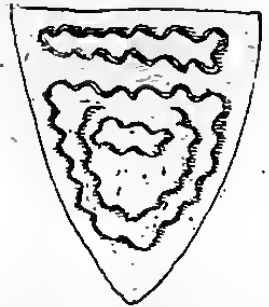


Fig. 3.

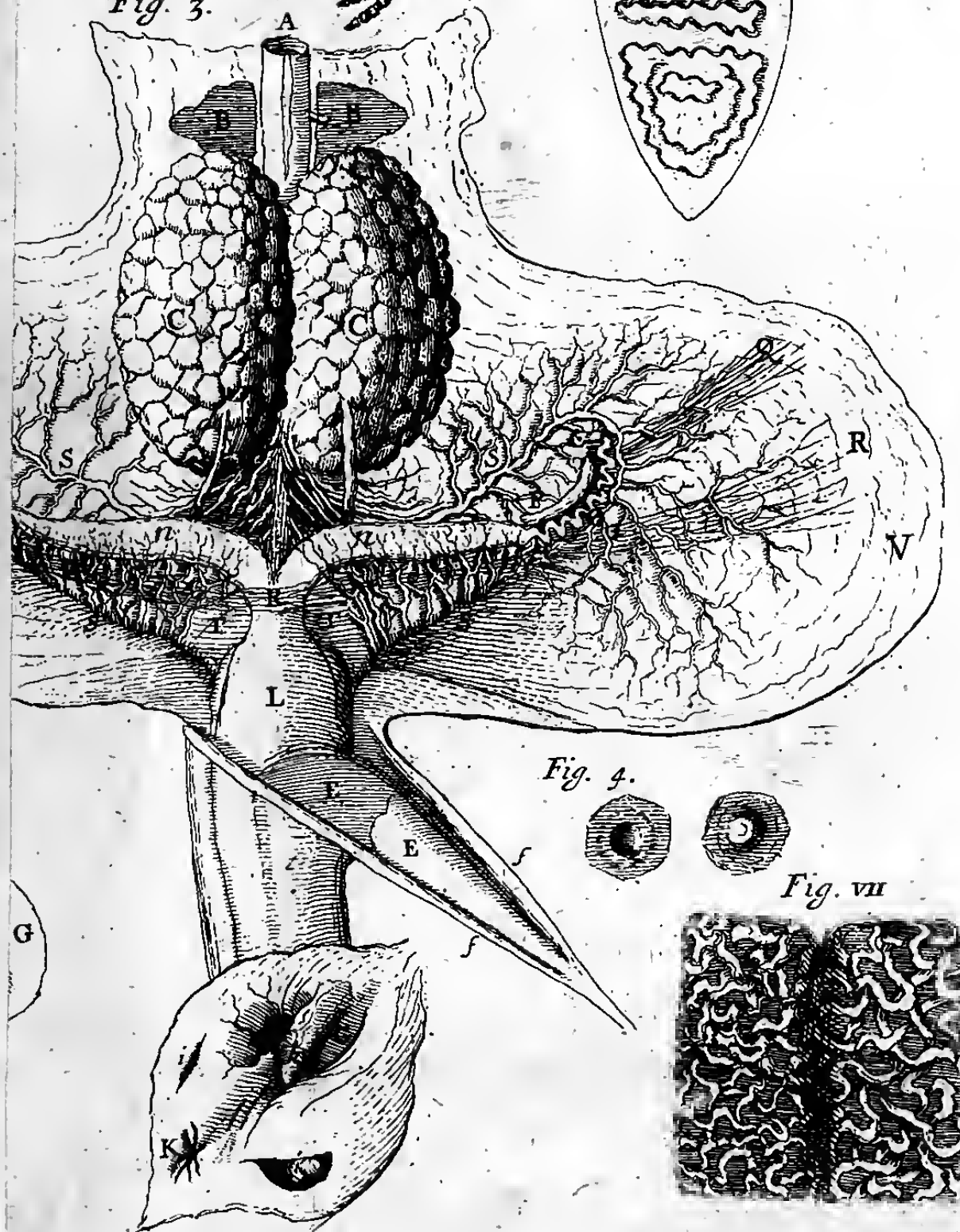
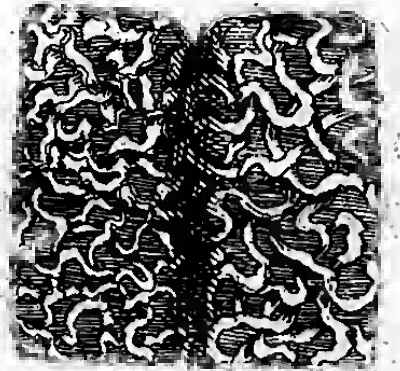


Fig. 4.



Fig. VII.





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A
Preliminary Discourse
Concerning
ANATOMY
AND A
NATURAL HISTORY
OF
ANIMALS.

Since first I applyed my self to *Physick*, and had spent some time in the various studies thereof; though each had its peculiar Charms, which allured and greatly delighted the Mind busied and employed therein; yet that of *Anatomy* in a more extraordinary manner affected my Genius. The great and useful discoveries that of late have been made by it in the *Lesser* World, have equalled, if not exceeded those done by curious Adventurers and Saylers in the *Greater*. New *Tracts*, new *Lands*, new *Seas* are daily found out, and fresh descriptions of unknown Countreys still from both brought in; so that we are forced to alter our *Maps*, and make anew the *Geography* of both again. Nor have the discoveries of the *Indies* more en-

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riched

riched the world of old, than those of *Anatomy* now have improved both *Natural* and *Medical Science* : Nor can I tell how otherwise we can attain to that advice of the Oracle, *γινῶσι σαυτὸν*, but by *Anatomy*. Nature's *Synthetic* Method in the compofure and ftructure of Animal Bodies, is beft learn't by this *Analytic* ; by taking to pieces this *Automaton*, and viewing afunder the feveral Parts, Wheels and Springs that give it life and motion.

Physick certainly muft acknowledge *Anatomy* its beft Cynofure ; and that Pilot muft needs err and wander, who without it, being ignorant of the various Seas and Coafts he fails in, fteers all in the dark and at random : or if poffibly it happens that fometimes he be caft into the defired Port or Haven ; yet he is to be efteemed more fortunate than fkilful. The diffection of *Morbid Bodies* affords the beft account of *Difeafes* ; and often indicates the cure in others : that of *Sanous*, informs us of the true texture and ufes of the parts. Both have their great advantages, both ought with equal Care and Sollicitoufnefs to be cultivated. But fince we muft know what is the right, before we can underftand the various deviations from that Rule ; great and laborious have been the Recherches both of the prefent and former Ages, for the attaining this : But in nothing have their endeavours been more fuccefsful than in making a comparative furvey. Nature when more fhy in one, hath more freely confeft and fhewn herfelf in another ; and a Fly fometimes hath given greater light towards the true knowledge of the ftructure and the ufes of the Parts in Humane Bodies, than an often repeated diffection of the fame might have done. Hence it is that the great Improvers of this Learning have digged fo much in thefe rich Mines, and have brought from thence fo vaft treafures ; though they are ftill fo far from exhausting them, or proclaiming Nature's Penury, that they cannot fufficiently extol her Bounty, or with too paffionate a Zeal follicit a farther profecution of fo great a work ; which by their example and fuccefs therein.

therein, they have both credited and encouraged. We must not therefore think the meanest of the Creation vile or useleſs, ſince that in them in lively Characters (if we can but read) we may find the knowledge of a Deity and our ſelves. What often our inconfiderate Ignorance diſregards and thinks but deſpicable, were there a juſt ſcrutiny made, it could not but excite our greateſt admiration, and extort a Confeſſion of its admirable contrivance and workmanſhip. In every Animal there is a world of wonders ; each is a Microcoſme or a world in it ſelf : And that great Conquerour of the world, who wept that there was but one for his ambitious Rage to ſpoil, at length more nobly had his deſires in theſe, and with greater Glory hath eterniz'd his Name, when after he had ravag'd the Air, Sea and Land, at laſt committed to *Ariſtotle* to write the Hiſtory of his Trophies. The wiſeſt of Kings and Men may be thought to have gained great part of his knowledge from them. Nor ever was there an Age ſo ignorant and Brutish, but in ſome meaſure or other hath endeavour'd to bequeath to Poſterity their Learning herein. Ours that hath ſo widely extended the *Pomæria* or former Boundaries of all good Learning, and with vaſt labour hath at laſt pulled down thoſe *Herculean* Pillars, that too narrowly confin'd its Empire ; having vindicated its juſt Liberties from the Tyranny of uſurping Authorities, and the Credulous ſlavery to ſome Great Names, does daily bring in its ſtores for the rearing a new and more laſting ſtructure of Natural Hiſtory. For impartially viewing the Buildings of the old, and finding in ſo many Places its foundations ſo weak and infirm, although many of its Materials may ſerve again, yet it has been thought more adviſeable to pull it down and begin a new, than to repair the Ruines of ſo decrepit an Edifice. In ſo great a work many hands are daily employ'd, ſome in battering down and removing the Rubbiſh, others in endeavouring to lay a good foundation ; ſome dig for new ſtone, others labour in poliſhing it ; others in inventing new and more conve-

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nient Instruments and tools to work with ; some give their Pains, others their Purfes ; all their defires and good wifhes to fo noble a design. But fince it will be fome time before we can expect fo vaft a Pile to be compleated ; great care muft be had, that what is brought in, be preferved and fecured either from the Injuries of the weather or times, or danger of being fquandered away, and that all may be ready at hand when they come to have occafion of using it in raifing this ftately fabrick ; for the modelling and contriving of which the skilfulleft Artifts muft be confulted with, though even the meaneft in fome things may give in their Informations. I fhall therefore here propofe a rude Draught or Sciagraphy of a *Natural History of Animals* ; fuch as haftily occurred to me ; not what may be done, or the thing requires, but what haply may afford fome Hints to others.

In compiling therefore a *Natural History of Animals*, I have alwayes thought that Ambition of fome of writing an *Universal*, more Pompous than Instructive ; for the Method they have ufually taken hath been to rake in all from former Authors, without feparating the weeds, or fifting the chaff from the Grain : By this they have farther propagated many antiquated errors, without adding much new Truths to the flock themfelves. But had they taken as much pains and travail in fearching the *Books of Nature* as they have in thofe of former Writers ; and inftead of giving us an account of Animals of *forrain* Countreys (which they could not obferve) they had made a curious and ftrict Inquiry into thofe of *their own*, their accounts would have been more faithful and welcome, and they have deferved more for this Particular, than their univerfal History.

Νήποιοι ἐδ' ἴσασιν ὅσω πλέον ἡμῖν παύσις.

I could therefore wifh we had a good History of the Animals of our own Countrey, and not like giddy Tra-

vellers ramble abroad to see fine things, and still remain ignorant of what we have at home. This History I could desire likewise might commence from the lowest degree of Animation in *Zoophyta's* or *Plant-animals*; inquiring here into Nature's first Rudiments and obscurer *Vestigia* of forming the Organs of an Amphibious life in them; then gradually ascending by her clew to run through all the various Tribes of *Animals*; carefully observing all along the Harmony she keeps, or the Liberty she takes in the different formation of them, and from the whole to give a general Prospect of her workings.

The various tribes of Animals I may reckon *Insects*, *Reptiles*, *Fishes*, *Birds*, *Quadrupeds*, and the *Intermediate species*; and of these may be given

An Account { *Physiological.*
 { *Anatomical.*
 { *Medical.*

The *Physiological Account* may contain

The Names { of } our own { Nations both { Antient
Synonyma's { or } other { Nations both { and
 { { { { { Modern.

Their general and external descriptions.

Their various species and subdivisions, and Characteristical marks.

The Places they most frequent or are bred in.

The season when, and the time how long they live.

Their way of Living, their Food, &c.

Any remarkable Observations relating to their sagacity, &c.

The use and Benefit they afford to Man, &c.

for { Food, and the best way of ordering them.
 { Cloathing.
 { Mechanical uses, &c.

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The Injuries they do, how to be avoided or remedied.

The wayes of taking, preserving, propagating or destroying them.

Former Naturalists in their Histories have contented themselves with more or fewer of these Inquiries, in which yet they too too oft misguide us by their Accounts taken from unfaithful Relators, or the fabulous Records of the Antients ; nauseating and obscuring the whole by tedious Philological Harangues, or troublesome quotations for the confronting or establishing the Opinions of some ; relying on others, when Autopsie, and their own Experience can only inform them ; and their Conscience and eyes may be as a thousand Witnesses. I cannot see how a Natural History of Animals can be writ without *Zootomy* ; at best their Accounts can be but superficial, and by them we may know a Pig from a Dog, or that this is a Bull, a Bear or Monky ; but still remain ignorant of the curious Contrivance and Mechanisme of Nature within ; just as if a person should think he had sufficiently described a Watch, when he had only taken notice of the Case, the Studs, the Glass, the figures and hand ; by this he may know it to be perhaps a Watch, but knows not how it so exactly measures time. This most necessary part therefore and most instructive,

The *Anatomical Account* may contain,

1. An accurate Dissection and Description of all the *solid* Parts, to be illustrated (where necessary) with Figures ; and herein to be mentioned not only their Site, Number, Figure, Colour, Magnitude, their Cavities, Vessels, Integuments, Substances, Ligaments, and Communications they have with other Parts, but likewise in some, a more strict scrutiny may be made into their utmost Textures, by unravelling the same, and by the assistances of Glasses and other Methods. Thus viewing Nature where she more plainly discovers herself, by the Logick of a fair Analogy we may conclude she works the same, where yet

her tracts are more obscure, and shuns the view of our most solicitous Inquiry.

2. But since life and the whole *Oeconomia Animalis* consists chiefly in the *fluid* Parts of our Bodies; I have alwayes thought it a too narrow confinement of Anatomy, when restrained only to the search of the *Containing* Parts. The *Contained* likewise and *Fluids* are capable of an *Analysis*, if not by the knife, yet fire: and the various mixtures made of them with *Acids* and *Alkali's* of various sorts and consistences; and observing thence the various Results of *Fermentations*, *Ebullitions*, *Coagulations*, alterations in *Colours*, and other Qualities, will afford abundance of curious and instructive speculations: and I would have not only a view to be made of all the Humours in each single subject, but upon the whole a Reflection to be made; and from such a stock of Experiments, we may warrant an Inference, and be more happy in our guesses about the uses of the Parts, and the Offices they perform in this Oeconomy.

3. The *Psychologia* likewise will here deserve to be considered. Sensation and Motion, and what other functions there are of the soul, by such a Comparative survey may be rendered more intelligible; and from a clearer knowledge of them in Brutes, at length we may come the better to know our selves.

4. Lastly, *Embryotomia* and the History of *Generation*. These as they will require a great deal of Labour in the Research, so will they abundantly recompence the Pains by the great plenty they will afford of fruitful Observations. Nature viewed in her naked form, in the first organization of Animal Bodies, before she hath drawn over the veil of flesh, and obscured her first lines by the succeeding varnish of her last hand, more freely displays herself, and suffers us to behold the disjoynted Parts of this admirable Machine, and how it is that in time she puts them all together: this certainly will be of the greatest consequence both for the knowing the structure and the uses of the Parts.

But that we may yet reap farther advantage from this disquisition, and render it serviceable for the Prolongation of Humane, as well as their own lives, I have added

The *Medical Account*, which may contain as well the Diseases they are most obnoxious to, with the History of Cures performed either by themselves, or the assistance of Others ; as also the *Copia* of Medicines that may be thence obtained, for the enriching and enlarging Pharmacy.

Physick, if we may believe the Antients, in its Infancy, took its Rise from Bruits ; they taught us the use of Clysters, Bleeding, Purging, Vomiting, the Sovereign vertues of Plants against Poysons, Hæmorrhagies, Wounds, Blindness, and almost the whole stock of all *Pandora's* Evils. And certainly were we but diligent in observing, our Reason might here learn a great deal, which Provident Nature hath taught them by Instinct to outdo us in.

Experience tells us, some Distempers sometimes are more happily cured in them, than in Men. Physick at first was but Empiricy ; success in one, encourag'd a tryal in another. I could therefore wish we had an History of Cures performed on Brutes. The Antient Physicians thought this study not be'low them ; hence 'tis we have the *Medicina Veterinaria*, *Mulo-Medicina*, *Hippiatria*, *Ἱεραποσιτικόν*, *Ὀρενσιποσιτικόν*, *Κυνσιποσιτικόν*, &c. By this we may not only preserve their Lives for our Profits or Pleasure ; but likewise be provided with further means of prolonging and lengthening our own.

Likewise on these Subjects when diseased, variety of Experiments may be tryed for the proof of the force of Medicines, for conquering the most stubborn distempers ; the causes of their ailments may be enquired into by Anatomy, and more daring attempts offered at, which at length by repeated success in them, may be essayed in Man. In short, there is no part of Physick but what may receive Improvements from them, there being not that difference between our Bodies and theirs, only our Intemperance

perance hath made us liable to a greater number of diseases.

As already they have furnished us with a great store of generous Medicines; so I doubt not, but that if a strict search were made, we might easily augment the stock from them. I could therefore wish, that this likewise were prosecuted, and the best Methods of preparing and giving them were faithfully recorded.

Having run through these three Accounts, the *Physiological*, the *Anatomical* and *Medical*, a reflection upon the whole may be made; and the *Pseudodoxia* or false Opinions of the Antients, and the *fabulous traditions* concerning them, may be taken notice of, rather by way of Catalogue than a larger Confutation.

But here it may be objected perhaps by some, That this design is too great to be effected, since a single subject so to be examined, will make a volume, and require some years, and the assistances of several heads and hands. But however slothful Ignorance may hence take a discouragement, yet nothing is insuperable to diligence and pains. But he certainly is to blame, who because he can't have all, grows sullen, and will have none. If what may, were but performed, such a stock would easily be added to by future diligence; and far better a little with accurateness, than an heap of rubbish carelessly thrown together. *Malpighi* in his Silk-worm hath done more, than *Jonston* in his whole book of Insects; and he and the Ingenious Dr. *Grew* have taught us far more of Plants, than either *Gerard* or *Parkinson*. Since therefore it requires so much Pains, Expence and Time, many hands must be engaged therein; although it were to be desired, that some whose great Labours and Experience had rendred them more capable and expert, were more immediately concerned. Nor were it difficult, were there more *Alexanders* to find out *Aristotles*.

All Animals are not capable of all these heads of Inquiry, and several are so near a kin, that having fully described a *Genus*, the accidental differences of its various *species* would be soon absolved; nor would there need a Repetition, but a bare Recital of the most remarkable discrepancies; as the Anatomy of a *Porpeſs* might indifferently serve for a *Dolphin*, and most of the *Cetaceous* kind. I could therefore wish that at least for the present we had an Account of the most *Anomalous* and *Heteroclite* sorts of Animals; or such whose *species* are most different. These Essays as they would animate Others to the Prosecution of the same, so likewise they would be a great help and assistance to them in the design. Something this way I may do perhaps my self; and though I may not be so able or skilful as to hit the mark, or to catch the Game; yet having raised it, and given the alarm to others, they may more successfully pursue it.

What is here performed in the Anatomy of a *Porpeſs*; since 'tis but from a single Observation, and the first of the kind I had opportunity of dissecting, I cannot think it so exact or full, but that another or my self upon a review, might meet with mistakes, or make additions thereto. Which is but what I have here done to those Accounts given us already of the Anatomy of this Fish, by the famous *Rondeletius*, *Bartholine*, *Jo. Dan. Major*, and *Mr. Ray*. However had it not met with more favourable Censures than my own, it might have still enjoyed, what it best deserves, the silent confinement of my Study. But since it creeps abroad, I must here acknowledge the kindness of my most Ingenious Friend *Mr. Hook*, and those worthy Persons, who gave me the opportunity of making the Observation; And his particular assisting me in design-
ing

ing several of the figures, and other favours deserve my best Remembrance.

I shall only farther add, that we may here take notice of something of Nature's working, and gradual formation of the different Species of Animals; who like a curious Artist in designing the richest Tapistry, does not hastily pass from one extreme Colour to another; but curiously shadowing and intermixing the same, does give a greater Grace and Beauty to the whole. This is but what hath been formerly observed by that ancient Christian Philosopher *Nemesius* in his περὶ φύσεως Ἀνθρώπου (p. m. 7.) where he tells us, ὁ γὰρ δημιουργὸς ἐκ τῆς κατὰ φύσιν ὁμοιοῦν ἐπισυνάπτεν ἀλλήλαις τὰς διαφορὰς φύσεις, ὥστε μίαν εἶναι καὶ συγγενῇ τινὶ πάντων κλίσειν. Several instances he gives of this *amphibious* or Hermaphroditical Nature of Animals and Natural Bodies; or as it were a scale or Gradation of them; as first in *Zoophyta's*, then in the Testaceous Kind and Worms, then in more complete Brutes; after in such whose sagacity approaches the confines of Reason; at last in Man and Intelligent Beings, that are a boundary between Divinity and the Creation. What we have here is a signal Example of the same between Land-Quadrupeds and Fishes; for if we view a *Porpoise* on the outside, there is nothing more than a fish; if we look within, there is nothing less. It cannot abide upon the Land so much as the *Phoca*, yet is often drowned in its own Element, and hath a constant need of the reciprocal motion of Air in Respiration. It is viviparous, does give suck, and hath all its Organs so contrived according to the standard of them in Land-Quadrupeds; that one would almost think it to be such, but that it lives in the Sea, and hath but two fore-fins. The Contrivance and Structure of several of its parts are most curious and admirable; much illustrating divers late Inventions

12 *A Preliminary Discourse concerning Anatomy, &c.*

of some, and affording good hints for making others. And certainly by carefully perusing these Books of Nature, we shall not squander away our time in trifles, but may expect to meet with what will both please and ravish the Phancy, inform the Judgement and enrich the mind with the knowledge of God in his works, and of our selves.

E R R A T A.

PAge 20. line 1. *r. roundish*: p. 21. l. 17. *Phia r. Plica*: p. 24. l. 14. after *it*, insert *pallidius*: p. 42. l. 24. after *Tympanum*, add, *had a small bone that did arise upwards; but part of it was broken off. We could not observe here either Incus, Stapes, or Malleolus, but to the Tympanum*—

P H O.

PHOCÆNA,
OR THE
ANATOMY
OF A
PORPESS.

THis Fish by *Aristotle* is call'd *Phocæna*; by *Pliny*, and divers others *Tursio*; in English a *Porpess*, *quasi Porcus Piscis*, or Sea-hog; by the Germans *Marſovin*; in Latin often *Marſuinus*, i.e. *Maris Sus*; and in *Athenæus*, *πορπίς* *ἡ φῶκα*, and indeed in several particulars it so much resembles that terrestrial Animal, that this Name seems not improper, but much more justifiable than those of divers other Fishes taken from land Creatures.

'Tis placed generally by *Ichthyographers* amongst the Cetaceous kind, and reckoned a Species of Dolphins. (a) *Bellonius* gives several particulars both in the Internal and External parts, wherein the Dolphin and Porpess dif-

(a) *P. Bellon. de Aquat. l. 1. p. m. 12.*

fer; but very much suspecting the truth of his Observations, I shall only take notice of one, mentioned by *Rondeletius*, *Aristotle* and *Bellonius* himself which is the *Rostrum* or Snout, which is much longer in the Dolphin than the Porpess, which is sufficient to distinguish them: and (b) *Ulysses Aldrovandus* does seem to make it the only distinction where he saith, *Quæcunq; etiam de Delphini utroq; sexu scripta sunt, Phocæna similiter conveniunt; & nisi Phocæna rostrum brevius haberet, Delphino fere undiquaq; similis foret.*

The * figure of this Porpess we dissected was oblong, its body roundish, its Head and *Rostrum* obtuse, the *Rictus* of its Mouth but small; it had two fins on the sides of its breast, one on its Back, and a semilunary tayle placed parallel to the *Horizon*, which in most other fishes but of this kind is vertical. The Aperture of its Eyes was but small. On the Head a little above the Eyes, it had a *fistula* or Spout arising from the Palate, which serves him for the drawing in Air for Respiration; as also for spouting out of water, as in the Cetaceous kind. On the Belly we observed the Place of the *Umbilicus*, and below that the † *Pudendum*, of each side of which were placed two * *Teats*; below the *Pudendum* was the *Anus*.

* Vid. Tab. I. Fig. 1.

† Tab. I. Fig. 1. bb.
* Ibid. a.

The *Dimensions* of its Body taken in the Decimal Measure of an Inch were as follows. From the tip of the Nose to the Extream of the Tayle was 412 decimals. Its greatest thickness, being at its Nose, was 82. The Girth of him in its biggest part was 250. At the beginning of its fins 230.

From the tip of the Nose to its Navel 180. to its *Anus* 300. to the Fin on the back 190. to the Fins on the breast 100. to the middle of the Spout 52. to its Eye 49.

The length or Aperture of its Eye 7. the distance

between the two Eyes in a straight line 52. from the hinder *Canthus* of the Eye to the *Porus Auditorius* was 17.

The length of the Mouth 30. the length of the outward *Rima* of the *Pudendum* 30. the length of those flits that were of each side, occasioned by the retraction of the teats, 7.

The length of the Fin of the back 40. the height of the same 27. the length of those on the Breast 70. the breadth 24. the distance between them 42. the spread of the Tayle 100. the broadest part near the Middle 37.

The whole weight of this fish was 96 *l. aver du pois*, that dissected by (c) *Daniel Major* weighed 124 *l.* but (d) *Jonston* mentions, that in *Neustria* there was one taken that weighed 1000 *l.*

The Colour of the upper half of the skin, that covered the Back, the Fins and Tayle was of a shining black; the rest very white: but on the sides a little above the fins, 'twas speckled of an Ash colour, or as *Major* expresseth it, marbled by the mixture of both colours, into spots and streaks.

The Skin was perfectly smooth, without either hair or scales, which I suppose did very much advantage its swimming, and may be the reason we did not meet with those *foramina* on the head and sides which are frequent in scaly fish, and which, as (e) *Steno* hath well observed, do discharge an oily substance, that serves for the lubricating the sides of the fish, and so renders them fitter for swimming; as our Watermen do commonly trim their boats, that they may the more easily glide on the water. However on the Nose of each side we observed two small holes that would only admit of a bristle.

(c) *Miscellan. Curiosa Med. Phys. Germanic. anni quarti Observ. 20.* (d) *Jonston Hist. Nat. de Piscib. l. 5. p. m. 221.* (e) *Nich. Steno de Raie Anat. p. m. 55. & Canis Carchariae dissection cap. p. 93.*

Bellonius, Rondeletius, Major, and others do mention the *Meatus Auditorius* which we likewise observed at that distance from the Eye, as hath been expressed: 'tis extream small, and whether really perforated at the skin, we somewhat doubted; for forcing a small bristle into it, after it had entered, it readily descended towards the *os Petrosum*.

The figure of the Aperture of the * *Spiraculum* or Spout was somewhat semilunar: 'twas placed across the forehead just before the Brain, and was almost an Inch in length. * Tab. 2.
fig. 9. A.

The shape of the *Back* was like the body of a Ship inverted, that were it not for its Fins and Tayle, it would easily turn downwards; but the contrivance is most convenient for swimming, by reason the water that is removed in swimming is that above them, which does most readily give way.

The Horizontal site of the *Tayle* in this fish is of great use. (f) Mr. Ray conceives it to be partly to supply the hindermost pair of Fins, which serve to ballance the body and keep it up in the water, answering in proportion to the hinder legs of a Quadruped; Hence we see that those fishes which have long Bodies, and but one pair of fins, as Eeles and the like, cannot keep themselves up in water, but lye alwayes grovelling on the bottom: Partly to facilitate the fishes ascent to the top of the water (to which he can immediately raise himself by a light jerk of his tayle thus placed) for the use of Respiration, which is as necessary for him as for Quadrupeds.

The structure of the *viscera* and inward Parts have so great an Analogy and resemblance to those of Quadrupeds, that we find them here almost the same. The greatest difference from them seems to be in the external

(f) *Philos. Transact. n. 76. p. 2275.*

† Tab. 2.
fig. x. &
xi.

shape, and wanting feet. But here too we observed that when the skin and flesh was taken off, the † fore-fins did very well represent an Arm, there being the *Scapula*, an *os Humeri*, the *Ulna*, and *Radius*, the bones of the *Carpus*, the Metacarp, and 5 *digiti* curiously joyned; the Tayle too does very well supply the defect of feet both in swimming as also leaping in the water, as if both hinder-feet were colligated into one, though it consisted not of articulated bones but rather Tendons and Cartilages.

The *Pudendum*, *Anus* and *Mammae* we shall describe when we come to those Parts to which they do belong. Next of all we shall take notice that the body was divided into three Regions or Venter, the Head, the Breast, and Abdomen. All of them had these common Integuments, a *Cuticula*, a *Cutis*, Fat, and a *Panniculus Musculosus*.

The *Cuticula* was a thin scarfe-skin, pretty easily separable by scraping with a knife from the *Cutis*. When any part was bent, 'twould wrinkle into exceeding small folds, but when unbent, 'twould readily return to its former smoothness.

The *Cutis* was $\frac{1}{10}$ of an Inch thick, pretty easily vulnerable and flexible. Its Colour was the same throughout; but where it was black, there on the innermost or concave part it was of the deepest colour.

* Tab. 1.
fig. 2. aaaa.

The *Fat*, or as Mr. Ray calls it, the *Blubber*, was an Inch, or in some places more thick; encompassing the whole body as in an Hog. It had a curious texture of fibres, which arising from the *Panniculus Musculosus* did decussate each other lattice-wise, and terminate in the Skin. Examining a small part of this Fat in a good Microscope, we observed it to consist of an admirable structure of numerous small cells or little bladders, in which was contained the Oyl; so that upon cutting any part the Oyl would readily run out. The Fat therefore or Blubber in this fish was nothing else but Oyl contained in those Cells or bladders.

There are three uses Mr. Ray assigns to this part,
 1. To keep the cold water at a distance from the bloud, which in this Animal is hot, and by an immediate contact would be apt to be chill'd. 2. To keep in the hot steams of the bloud from evaporating. 3. Perhaps also to lighten and counterpoise the body of the fish, which would otherwise be too heavy to move and swim in the water. Bartholin saith, that they make use of the Oyle for Lamps.

The *Panniculus Carnosus* here was remarkable, consisting of muscular fibres, which were of a more florid red, than that of the Muscles. Its fibres from the back seemed obliquely ascending; but from the joyning of the *sternum* to the *Costæ* and so proportionably on the *Abdomen*, descending obliquely and meeting at the *Linea alba*. I just now mentioned the fibres that did run from the *Panniculus* through the fat to the skin: the use of them may be, more firmly to hold to the skin, which if joyned only to the fat, would be much more easily separable. They may likewise give a Motion to the skin, as the *Panniculus Carnosus* does in Brutes. And lastly running through the Fat or blubber, they may very much strengthen the Cells or bladders.

The *Muscular flesh* of this Animal resembled not that of Fish, but rather Quadrupeds, being very Sanguineous, but of a dark red Colour. On the *Abdomen* we observed the *Musculi obliquè ascendentes, obliquè descendentes, transversales, & recti*. The tendons of the three former constituted the *Linea alba*, which was very broad and of a more curious but looser texture than usually; for we could easily perceive how they did run in several *Manipuli*, being interweaved and decussating each other as represented in *Fig. 1. Tab. 2*. The *Musculi Recti* were very thick and large; on the Inside we observed the *Vena* and *Arteria Mammaria* and *Hypogastrica*.

Under the Muscles of the *Abdomen* lyes the *Peritonæum*, which is a thin though a double Membrane, in the duplication

* Tab. 2. cature of which there lyes the * *Bladder*. Of each side
fig. 3. EE. the *Bladder* there are fastened to the *Peritonæum* the two
† *ibid.* PP. † *Ovaria* or *Testicles*, the Extreame of the || *Cornua Uteri*, as
|| n n. also the *Ala Uteri*. The numerous branches of large
* *ib.* fff. * blood vessels that run to them, afforded a very pleasant
† ff. sight. To the Navel were fastened the *Vena* & † *Arteria Umbilicales*, as in *Quadrupeds*.

(g) *Bartholine* and *Jo. Dan. Major* do both expressly deny that it hath any *Omentum*; But in that which we dissected we observed a pretty large one; but not extended over the Guts as in other Animals, but drawn up and lying loose between the Stomach and Intestines. 'Twas fastened to all the Stomachs, and received from them a great number of Sanguinary Vessels. It had its duplication as in *Quadrupeds*, but no fat on it. Its whole texture seemed to be nothing else but an admirable Schematism or Network of Vessels and Fibres, which our naked Eye as well as Glasses could discover, and is in part represented in *Fig. 6. Tab. 1.* (h) *Rondeletius* does mention an *Epiploum* in Dolphins, as also does (i) *Severinus* in his *Phoca*, which he does describe to be without fat, which I rather think is natural, than, as he supposes, by a contabescence.

* Tab. 1. On the *Omentum* several Glandulous Bodies are fastened,
fig. 6. K. * a large round one growing thereon near the first stomach about the bigness of an ordinary Wallnut, being of a dark flesh Colour, and having a great many vessels common to it with the stomach, which *Bartholine* calls the *vasa brevia*. At a small distance from this are placed several other lesser ones, some of the bigness of an Hazel Nut, others of a Pea or Pepper Corn, in all in number about 10 or 12.

Where Mr. Ray does say the *Spleen* was small and

(g) *Tho. Bartholin. Histor. Anat. Cent. 2. Obs. 25.* (h) *Rond. de Pisc. l. 16. cap. 8. p. 449.* (i) *M. A. Severini Phoca illustratus, p. m. 31.*

roundish; I suppose he means the largest of these Globules. Bartholine took notice of two as the most conspicuous, and calls them the spleen. Dan. Major mentions 4 or 5. and saith they are so like the substance of the spleen, *ut viderentur totidem splenes esse*; but presently after adds, *& ipse Lien quidem peculiaris ac distinctus in propria sede quoque comparuit, sed ex multis similibus globulis veluti compactus*; if that by this he means any part different from the former globules, his Animal was different from ours, for we could observe no such thing. But as the Kidneys here consisted not of one entire substance, but of abundance of distinct Glands, so likewise the Spleen which is a conglomerated Glandule, had its various Portions distinct and more separated; so that as it may be said to have three hundred Kidneys, so likewise ten or more Spleens. (k) Rondeletius observes that in Dolphins, *Lien in recens natis magnus pro corporis ratione, in adultis parvus & niger*.

These Globules or Spleens were not fastened, as Major hints, to the stomach, although placed near it; but to the Omentum; as also was the † *Pancreas*, which at its Basis † Tab. i. Fig. 6. H. was appended likewise to the *Duodenum*, where its ‖ *Ductus* entered and emptied it self a little below the ‖ Ibid. i. *Pylorus*, and not into the third stomach, as Mr. Ray asserts.

The Colour of the *Pancreas* was whitish, as in other Animals. At its basis 'twas thick, and thinner towards the edges, where it seems orbicular or roundish. It was about 2 Inches and $\frac{1}{2}$ in diameter. One side was flat, the other protuberant. The *ductus Pancreaticus* was pretty large. Major saith, that the *Pancreas* he observed, was *longum valde & exprorectum*. But Bartholine describes it to be *triquetrum*.

The Stomach in this fish was very remarkable, consist-

* *Tab. I.* ing of 3 Bags. The * first which was the largest, was
Fig. 6. A. about ten Inches in length, and 3 in breadth, resembling a
 † *B.* long Pouch or Urinal. Towards the upper † part it em-
 ‖ *C.* pties it self into the second ‖ Ventricle which is about 6
 inches in length, and 2 and $\frac{1}{2}$ in breadth. This at the
 * *D.* * side near the *fundus* by a long descending narrow pas-
 † *E. E.* sage is emptied into the † third, which is about an Inch
 broad; which sending one part downwards, is again re-
 flected upwards as represented in *Fig. 6. Tab. I.*

The Stomachs are made up of several *Tunics*; for in the *first*, besides the *Membrana communis* we easily discovered a Muscular Tunic under it, and in the inside a strong white Nervous one, which very much resembled the inward Pellicle of the Gizzard of Fowls. It had abundance of small *rugæ* or rather furrows or lines; but at the orifice, where it empties it self into the second ventricle, the *Plicæ* or folds were very large and numerous, that rendered the Passage so strait, that nothing but a fluid *Chymus* could be transmitted.

The inward *Tunic* of the *second* stomach was a pleasant sight, having large *rugæ* length-ways, from the sides of which at certain small distances issued mutual Protuberances of the same substance. The Colour of the whole was a florid red, very much resembling the branches of red Coral. By scraping with a knife I could express a great deal of a Chymous substance out of it, and pretty easily separate this tunic from the next. It was about $\frac{1}{2}$ of an Inch thick, and seemed to be glandulous. The Passage out of this ventricle into the third was very strait, having a sort of Rugous Annular valve, and a Passage about an inch in length before it empties it self into the third ventricle.

The *Tunics* of the *third* ventricle were much the same with those of the Intestines, and in it nothing is more remarkable than the ‖ *Pylorus* or Passage into the *Duodenum*, the Tunic there being so contracted and pursed in, that it leaves a Passage only about the bigness of the hollow of a Goose-quill, though outwardly 'tis almost

almost as large as either the Ventricle it ſelf or the Inteſtine.

Mr. Ray in the ſtomach of the Porpeſs he diſſected, found a great number of Sand-Eeles, Launces, or as call'd by *Gefner*, *Ammodytæ*. *Dan. Major* found in his the Spines of fiſhes, ſmall *Tellinæ* and particles of other of the Teſtaceous and Cruſtaceous kind, and Sand. In ours we obſerved the Spines of fiſhes, and 2 or 3 Herrings pretty intire, having only their outward Parts corroded. Likewiſe in the *Oeſophagus* or *Gula* (whoſe inward Tunicle was almoſt the ſame with that of the firſt ſtomach) were the bones and ſpines of ſeveral fiſhes. In the ſecond and third ſtomach was only a Chymous ſubſtance or a *Colliquamentum Chyloſum livido-albeſcens*, as *Major* words it.

Digeſtion here ſeems to be performed by a gradual Corroſion firſt of the outward parts, and ſo penetrating inwards. But whence the *Menſtrum* that performs this Office is tranſmitted, is difficult to determine. For in the inward Tunicle of the firſt Stomach there are no Glands ſeated, that might ſeparate ſuch a liquor; nor are the *Plicæ* or *Rugæ* ſo conſiderable, as to contain any great quantity of the Reliques of a former digeſtion, as to ſerve for a ſucceeding ferment; But ſeem rather a ſtrong cloſe white membrane like the inward Pellicle of the Gizard of fowls, and by this means leſs capable of any injury from the bones and fragments of ſhells that are oft contained in it. But as in fowls there is placed a little above the Gizard abundance of Glands, that ſecern a liquor that ſerves for the moiſtening and digeſting their hard food, which afterwards is farther comminuated by the grinding of the ſtrong Muſcles of that Ventricle; ſo I am apt to think that in this fiſh, the *Glandulæ Maxillares* and thoſe other that are very large and numerous, and are placed about the *fauces* and the neighboring parts, do ſeparate a *ſaliva* or liquor that may conduce much to this uſe; unleſs we may think that that large Glandulous Tunicle in the ſecond ſtomach may ſecern a Juice there, that may regurgitate into the firſt. However
ſince

since all Glandules do make some separation, we may reasonably suppose that this made by this Glandulous tunicle doth serve for the further fermenting the Chymous *magma* transmitted out of the first Ventricle. And nature seems very solicitous herein, by making the Passages out of one into the other so strait and narrow, that it can't easily be transmitted from one to the other, before it hath undergone its due digestion in each.

Meeting with so many Bones in the *Gula*, it made me think whether possibly after the flesh is corroded from them, it might not vomit them up ; or whether the *Gula* may not in part perform the Office of the stomach, having its inward Tunicle the same. In several fishes there is no *Gula*, but the stomach reaches up to the Throat.

The *Intestines* in this fish were long and small, being eleven times the length of the fish, or about fifty foot. They were almost equally throughout of a bigness, only something larger toward the *Duodenum* and *Anus*. It had no *Cæcum* or *Colon*.

Opening the Extream of the *Rectum* in the inside, I observed a white Pellicle or Skin like the inward Tunicle of the first stomach of this fish. From the *Anus* 'twas about three inches in length ; above this the Intestine was of the same make as elsewhere. About an Inch and $\frac{1}{2}$ from the *Anus* under this Pellicle I took notice of a pretty large glandulous body that empties it self by several *ductus's* that perforate this Pellicle into the Cavity of the Intestine. The *Ostia* of some of them were pretty large, of others but small, yet would easily admit a bristle into them.

The *Anus* is placed a little below the *Pudendum*, it had its Sphincter Muscle : by the falling of the skin in several *Rugæ* 'twas so closed that no water could get in.

The *Mesentery* in respect of the length of the Intestines was but small, yet had numerous Meseraic vessels branched as in other Brutes. The *Pancreas Asellii* was large,

consisting of abundance of Glands and seated in a somewhat semilunar figure. From the *Pancreas Asellii* running towards the *Receptaculum* we observed several *Vena lactea* pretty large, as likewise some smaller ones coming from the Intestines to the *Pancreas*.

The † *Liver* is pretty large, not divided into Lobes as † *Tab. 2.*
Mr. Ray does affirm, but as in a Humane Body one intire *Fig. 2.*
viscus. It lyes under the Diaphragme, the greatest * por- * *A.*
tion of it in the right Hypochonder, and the ‖ lesser in the ‖ *B.*
left. It is in length 10 inches, in the broadest part about
6 and $\frac{1}{2}$, but in the middle where it has the † *Ligamentum* † *c c.*
suspensorium, about 4. It is about 2 inches thick, it weigh-
ed 3xxvii. 2. Its Colour was of a florid red: *Bartholine*
observed it *pallidus*, The Ramifications of the sangui-
nary vessels in it are very large and numerous. It had no
vesicula fellea or Gall-bag, as hath been likewise observed
by former Writers. The * *vena Umbilicalis* had its * *d.*
passage yet open. The figure of the Liver is best under-
stood by the Cut.

The ‖ *Kidneys* were a very pleasant sight, consisting of † *Tab. 2.*
abundance of distinct Glands separated by their proper *Fig. 3. cc.*
Membranes from one another, but all included in one com-
mon Tunicle as they are in a Bear, a Calf, an Otter and
some other Animals.

Each Kidney is in length about 5 Inches about, 2 and
 $\frac{1}{2}$ in breadth, and in the thickest part somewhat more than
an Inch. Each Gland was about the bigness of a large
Pea. At the outward surface for the most part they
seemed Sexangular or Pentangular, a double order of
them composed the body of the Kidney, and they were in
all about 150 or more in each.

Each Gland seemed a distinct * Kidney; for opening * *Tab. 2.*
several of them I observed a Glandulous or Cortical part *Fig. 4.*
which was the outwardmost, and was of a red Colour.
Inwards there was a somewhat whiter substance that re-
sembled a *Papilla*, being larger at its basis and rising by
degrees

degrees to a point, which I conceive to be made up of the urinary *Tubuli*; which conveys the Urine into the *Pelvis* or Cavity that is in each of them, after 'tis separated by the Cortical part.

† *Tab. 2.*
Fig. 3. A. The *Vena † Cava* was large, and did run along upon the Spine between the two Kidneys. Towards the upper part of the Kidneys, it sent forth the *Emulgent*s, which are presently ramified, sending a branch to each Gland. Under the *Cava*, as also under the emulgent veins in the Kidneys, the *Arteria Aorta* runs, and is branched accordingly. There was no common *Pelvis* belonging to the Kidneys, but a distinct one in each single Gland. From every Gland there did arise a peculiar *Ureter*, but all at length uniting in one common trunk, it did emerge out of the body of the Kidney towards the lower end, as is represented in the || figure, and afterwards it was inserted into the neck of the bladder.

* *Tab. 2.*
Fig. 3. BB. The * *Glandula Renales* were of a triangular figure, about an Inch in Diameter. They seemed to consist of a Glandulous membrane, which being folded up into several † *Plicæ*, between them there was a small Cavity, which yet was not so large or entire as is in some other Animals.

|| *Tab. 2.*
Fig. 3. EE. The || *Vesica Urinaria* or Bladder was placed between the Duplicature of the *Peritonæum*, as hath been related. 'Twas of a Conical figure, five Inches long and one broad, a little below its neck, and so arising to a point at its *fundus*; being blown into, it seemed not capable of much extension. Of each side it there ran the two * *Arteriæ Umbilicales* as in Quadrupeds. The *Ureters* were inserted just below the neck, and having opened the Bladder we could easily perceive their *Ostia*, and probe into them from the bladder.

The neck of the bladder is very strait, and runs along the sides of the *Uterus*, and empties its self just at the

bottom or rime of the *Pudendum*, having a protuberant body lying over its Orifice, which *Dan. Major* calls the † *Clitoris*, which is made up of strong fibres almost Carti- † *b.* lagineous.

This leads me to the Examination of the *Organs of Generation* in this Animal, which no less than the other parts did extremely imitate those of Quadrupeds; and even in the whole dissection I could easilier imagine I was cutting up a Dog, a Swine, a Calf or any other terrestrial Brute, than an inhabitant of the watery Element.

Our subject was a Female; and here we shall take notice of the *Vasa præparantia*, *Ovaria*, *Tubi Fallopiani*, the *Uterus*, the *Pudendum* and *Ubera*. I shall begin with the ‖ *Uterus*, which was about five inches in length, and had ‖ *Tab. 2.* two large * *Cornua* as in multiparous Animals, each *Fig. 3. L.* about four inches long. The *Cornua* were fastened to the * *NN.* *Peritonæum*, and had membranous † *Alæ* fastened to the † *TT.* same also. All along the inside of the *Cornua* we observed to run a *Manipulus* of ‖ muscular fibres, which ‖ *RRR.* expanding themselves at length into two originations, were inserted into the *Peritonæum* at the sides a little below the Diaphragme. Arising also from the *Ovaria* and extreams of the *Tubi Fallopiani*, there were other * fibres * *QQ.* that inserted themselves likewise into the *Peritonæum*. Both these fibres may serve to regulate the motion of these Parts, either for the conveighing the Eggs from the *Ovarium* to the *Tubus*, or the excluding the *fœtus* from the *Cornua* into the *Uterus*.

Having opened the *Uterus* I could easily observe a distinction of a *Vagina*, an *Os Uteri internum*, and *fundus*. The *Vagina* was pretty large, had several *Rugæ* or *Plicæ*, but towards the *fundus* these *Plicæ* cross-ways were so very large and over-folding that they seemed almost wholly to occlude the Passage, or at least to render it very difficult to probe, and made a very strict *Ostium*. This part in the inside had *striæ* or *fibræ longitudinales*.

Between

Between its *Plicæ* I did observe a pretty Quantity of a mucous substance contained, as also in them and in part of the *Vagina* several small Glands about the bigness of a Pin's head. These probably may serve for the separating this *mucus*, which I can't imagine to be any thing of a *Colligamentum Genitale*, which *Major* seemed at first to suspect; but rather of the same nature with that found in Cows and other Animals.

† 00. At the extreams of the *Cornua* were the † *Tubi Fallopi-ani* pretty large, when blown up, running in an undulating line the length of the *Ovarium*, and then reflected and terminating in a large *Ostium*, to which as also to the extreams of the *Ovarium* those muscular fibres before described did run, being first colligated into a small node or *Plexus*, and thence expanding themselves.

‡ P. P. This I suppose is what *Major* means by his pervious passage from the Testicles to the *Uterus*, though he had forgot to what part of the *Uterus* it did go. The * *Ovaria* or testicles in our subject were a little more than an Inch in length, about the bigness of a Goose-quill, in Colour somewhat whitish, its surface smooth. *Major* observed it tuberos and unequal. *Bartholine* in one that had a *fœtus* in the left *Cornu*, observed the left testicle tumid and as big as a Wall-nut, but the right was longer and slenderer. Opening the *Ovaria* I could observe the rudiments of many Eggs, but very small.

|| S S S. The *Vasa Præparantia* and || Sanguinary Vessels that came to these parts, were more numerous and larger than in any Animal I have hitherto dissected, but running in a greater plenty to the *Cornua* and *Ovaria* than to the *Uterus* its self. They had frequent *Anastomoses* one with another; and being so very large and thick set, afforded a very pleasant sight; Nature seeming here mighty solicitous and provident for the nourishment, as well as forming the *fœtus*; it being a Viviparous Animal; and in one that was pregnant with young that *Bartholine* dissected, he observed a *Placenta*, a *Chorion*, *Amnion* and *Allantois*, a *funiculus Umbilicalis*, in the *fœtus* the *Vena* and *Arteria*

Umbilicales, an *Urachus*, a *Canalis Venosus*, *Canalis Arteriosus* and *foramen Ovale*, all as in the Embryo's of terrestrial Animals or Quadrupeds. Nor are the Organs of Generation in the Males different, they having (as hath been observed by the same *Bartholine*, as also *Mr. Ray*, *Rondeletius*, &c.) a large *Penis* partly sheathed within the body, as in a Bull, *Testiculi*, *Epididymides*, *Vasa Preparantia*, *Deferentia* and *Prostata*, so that there is no doubt here of their manner of Generation, though in other fishes where there is no *Penis*, 'tis more obscure.

It remains that we describe the *Pudendum* and *Ubera*. The outward *Rima* of the former was about six inches in length; dilating it a little we could discover what *Major* calls the *Ala* and *Clitoris*. The latter being a small hard body protuberating over the *Meatus Urinarius*. The Passage into the *Uterus* was straitned by the subsiding of the membranes into several *Rugæ*. For the governing the Motion of this part we observed some muscles were appointed, as likewise of each side there were two small bones which did form an *Os Pubis*. *Rondeletius* observed the like in a Dolphin. || Tab. 2.
Fig. 3. b.

The **Ubera* were placed of each side the *Pudendum*, **ii*. only two in all, each side one. The Teat or *Papilla* was small and retracted inwards, so that without dilating the Part we could only see outwardly a slit or *Rima*. In time of Lactation this part I suppose is much larger and more protuberant, this being but a young one and never (as was supposed) impregnated. (1) *Rondeletius* denies that there are any *Papilla* conspicuous in a Dolphin, but saith, *Harum vice Alveoli humoris duo sunt, utrinque unus, è quibus lac fluit, quod ore Catulorum Parentes sectantium excipitur*; and in another, (m) place does quote *Aristotle* (*Hist. Animal. l. 2. cap. 13.*) for the same Opinion, which yet does seem to me less probable. The Udder or *Ubera* under the skin seemed to be very large, consisting of abun-

(1) *Rond. de Piscib. l. 16. c. 8. p. 462.* (m) *Rond. de Pisc. l. 3. cap. 23.*

dance of small Glands somewhat distinct and separate from one another. Several blood-Vessels did run to them; and generally I may say of the whole Body, there is scarce any Animal in which the Veins and Arteries are more curiously branched or more numerous than in this. For on the † *Musculus Psoas* their Ramifications were so many and large, and their *Anastomoses* into one another so frequent, that they formed a curious Net-work, and afforded a very pleasant sight. And no less Curiosity we observed in the blood it self, by examining a small part of it with a good Microscope: for after it was a little dried on the object plate which was of Glass, we found that it had shooted into a most delicate regular figure, being reticular like the texture of the *Omentum*; only that from the sides of the several *Area's*, there were some small branches or shootings of fibres that were not continued.

† Tab. 1.
Fig. 2. H.

We come now to the *middle Venter* or the *Thorax*, which was large and capacious, covered with Muscles almost as in Quadrupeds, having two large Pectoral Muscles that went to the fore-Fins, as likewise several other Muscles that did serve for the performing its various Motions, and were curiously contrived. There were two *Musculi Intercostales*, *externus* and *internus*. It had * thirteen Ribs of each side, five fastened to the *sternum*, two other had Cartilages, but not quite continued to the *sternum* unless by tendons. The Ribs as they descended grew shorter, so that the last was but a little higher than the *Musculus Psoas*. I shall give a fuller account of the Ribs, as also the *Sternum*, when I come to describe the *Skeleton*, and shall only add that the Ribs arising from the Spine do incline towards the *Abdomen*, so that they make a very acute angle with the Spine. The Cartilages or rather bones that go from the first five Ribs to the *sternum*, are reflected upwards towards the head and make with the *Costæ* acute angles also. At the upper part of the || *sternum* which was broad, and

* Vid. Tab.
1. Fig. 2.
& Tab. 2.
Fig. x.

|| Tab. 1.
Fig. 2. d.

some.

somewhat depressed there were inserted two large and thick Muscles that ran towards the *Maxilla*. These probably by contracting may serve to draw the *Sternum* upwards, as the *Musculi recti* which are inserted into the bones of the *Sternum*, downwards, and so promote Respiration ; which likewise is farthered by those other Muscles, which are also common with this fish and other Quadrupeds that are destined to that office, and chiefly by the

* *Diaphragme*, which in this Animal was very remarkable ; for it had no *Aponeurosis* or Membranous tendon in the middle, but was muscular throughout. It was fastened to the *Sternum*, the Cartilages and the other Ribs downwards. It had a deep hollow in the middle, as it were pulled into the *Thorax*, which was occasioned by having the *Pericardium* fastened to it which did draw it in. The Tendons of this Muscle were very curious : for besides those large ones that did run down by the Spine, there were several *Manipuli* of other tendons that went over the *Musculus Psoas*, and even in the middle or body of the *Diaphragme* there did appear abundance of tendons running over the muscular fibres, as where the *Vena Cava* perforates it, and in other places, though not very regularly or in any set order, but more confusedly. These tendons appeared of both sides the *Diaphragme*. * *ib. f.*

Dan. Major mentioneth a *Mediaſtinum* but we could observe none, but it was supplied by the joyning of the *Pericardium* to the *Sternum* ; 'twas fastened also to the *Diaphragme* as in men, and did draw it upwards. The *Pericardium* was very large ; what water was in it I do not well remember ; *Bartholine* observed it to be cruentous, which I suppose was from the dissection.

The † *Heart* was long, of a triangular figure, about † *Tab. 2.*
four Inches from the basis to the Cone, and as many at *Fig. 6.*
the largest part of the basis, about an Inch and $\frac{1}{2}$ thick.

It

It had two large Ventricles and as many Auricles. Towards the Cone the Ventricles seemed a little divided. The valves of the Ventricles and of the *Arteria Pulmonalis* and *Aorta* were not different from those in Quadrupeds, but the *Carnea Columna* in the left Ventricle were larger and more numerous and curiously interwoven lattice-wise.

The *foramen ovale* was closed and not open; where it had been, we could perceive by its thinness and transparency. We did not think of it then to look for the *Canalis Arteriosus*, but probably its passage may be likewise shut, as is also the *foramen ovale* in a Beaver and an Otter, as it hath been observed by some at (n) *Paris*, though 'tis delivered by others that in these Amphibious Animals 'tis kept open, that they may be the better able to keep under water, the Circulation of the blood being continued by this means without being transmitted into the lungs as it is in the Embryo's of Quadrupeds in Utero. The same is affirmed by (o) *Severinus* concerning Ducks and Geese, and thence he gives a reason why they are not suffocated by diving under water so long, or strangled when holden by the neck in ones hand.

* Tab. 1. The * *Lungs* had only two large lobes, each of them
Fig. 3. CC. about ten inches long and about 4 and $\frac{1}{2}$ broad, and two inches thick when not extended, and did in one part adhere to the Diaphragme a little below the entrance of the *Bronchia*. It had several *Glandulae* containing a Steatomatous matter. The Lungs were encompassed with a strong membrane, which being taken off, the minute ramifications of the Sanguinary Vessels were very pleasant to behold. The *Parenchyma* of the Lungs was the same with that of Quadrupeds, and when blown up were very large; which makes me suspect the truth of that assertion of (p) *Rondeletius* concerning the

(n) *Memoires pour servir à l'Hist. Nat. des Animaux.* (o) *Phoca illustrat.* p. 37. (p) *Rond. de Pisc.* l. 16. c. 8.

lungs in a Dolphin that they are *densiore substantiâ quàm in terrestribus, crassitudine & colore Epar referunt*. And the reason he gives wherefore it should be so, seems not satisfactory.

The *Windpipe* or *Arteria aspera* was very short, as it must needs be, this fish having no neck. The *Larynx* was of a singular figure and very remarkable, which I shall describe with the parts belonging to the head. But before I leave the *Thorax* I must take notice of a seeming † Glandulous body that did lye of each side the *Spine* about two inches broad and the length of ten or eleven Ribs. It was continued likewise a little over some of the Sanguinary Vessels that went to the head. It was a curious contexture of sanguinary vessels variously contorted and winding, emerging from the *Medulla Spinalis* at the holes where the Nerves come out between the Ribs, and as we afterwards observed the same substance likewise for a good thickness covered the *Medulla Spinalis* throughout. In the *Thorax* in some places 'twas above a quarter of an Inch thick, but every where it appeared of the same Contexture, a winding and convolution of blood-Vessels. What this part may be, is more difficult to assign, since it does not usually occur in the dissection of other Animals, and has not been taken notice of, as I know of, by any in this. But whether it may be that the heat of so much blood contained in so many vessels may serve for the invigorating the Animal Spirits in the *Medulla Spinalis*, or whether it may not be a Glandulous body and so serve for the draining of the serosities of the blood and thereby render it fitter for generating Spirits, or what other uses it may have, is to me yet obscure. Formerly dissecting a fish which *Hippolytus Salvianus* calls *Lupus*, under the *Cranium* I observed a much like substance enveloping the Brain, and was of a good thickness; the *Pia Mater* in Colour and luster exactly imitating leaf Gold.

† Tab. 2.
Fig. 7.

* *Tab. 1.* Above the *sternum* was placed the * *Thymus*, which was
Fig. 2. C. a large Conglomerated Glandule. We observed likewise
 the *Glandula Maxillares*, *Glandula Thyroidea* and some
 others. At the root of the tongue there were several
Tab. 1. small || *foramina's* which we supposed to be the *Ostia* of
ig. 3. aa. salivatory *Ductus's* ; We could probe them with a bristle.
 But where the *ductus salivalis* of the Maxillary Gland was
 inserted, either our inadvertency or want of leisure made
 us neglect to examine.

The *Rictus of the Mouth* is but small, yet the passage
 into the *Gula* is pretty large and open. The *Teeth* are so
 placed that those of one Jaw are received into the dis-
 tances of the other. There are twenty four of each side
 either *Maxilla*, ninety six in all. They are but small, and all
 of the same form, somewhat acute. Wherefore (q) *Jon-*
ston is mistaken who saith, they have *dentes obtusos Ho-*
minis molaribus similes. These teeth are somewhat move-
 able as is observed by *Dan. Major*, since they are not
 fastened in distinct sockets or Cells as is usual in other
 Animals, but only by a strong membrane or Cartilage,
 there being one common furrow in each Jaw into which
 the Extrems of all of them are received : These teeth
 are so small and short that they seem unfit either for ma-
 stication or fight, but only to detain their Prey till such
 time as they can conveniently swallow it whole. (r) *Ron-*
deletius does observe that in fishes that do suck, the teeth
 are at first soft and covered, that they might not injure the
 Breast. But Nature here does seem farther provident,
 in that just before it has left a space void of teeth, and
 the neighbouring teeth that are next it are also shorter
 than the rest.

(q) *Jonst. Hist. N. de Pisc. l. 5. p. m. 221.* (r) *Rond. de Pisc.*
l. 3. c. 7.

The * Tongue was very curious, of a muscular or fleshy substance, a little indented at the edges, about 2 Inches and $\frac{1}{2}$ long, and about 1 and $\frac{1}{4}$ broad and pretty thick, but so firmly fastened all along to the bottom of the Mouth, not to the Palate as *Major* and *Bartholine* say, that it can't exert or thrust its self out beyond the Verge or Limits of the Mouth. And herein a Porpoise differs from a Dolphin: for as *Rondeletius* does observe, *Delphinis lingua est mobilis, quæ modo exeri, modò condi potest, non hærens Palato*; and the same is asserted likewise by *Pliny*, *Solinus* and others: and expressly in (f) *Rondeletius*, *Delphin linguam longiorem habet Marfuino, Marfuinus eo latiore*: and therefore in his Figure he represents it hanging out. The use of the Tongue here I conceive is not for forming a voice; for that grunitus they sometimes make may be rather formed in the parts of the fistula; nor probably for tasting, since they swallow their prey whole: But rather when young to help the motion of sucking, and when elder that of deglutition.

At the Root of the Tongue was the || Larynx which was very long and protuberating, having its extremity answering and somewhat inserted into the bottom of the fistula, like a Ducks bill: *Bartholin* saith that *Collum Anserinum* refert; Mr. *Ray* makes it to resemble the Neck of an old fashioned Ewer, as *Casseri* likens that of a Hog to a *Gutturinum*. The make of it was very curious and different from other Animals, chiefly in the length of the *Cartilago Arytainoides*, the *Epiglottis*, and the Structure of the *Scutiformis* or *Thyroides*. The * *Cartilago Annularis*, or *Cricoides* was much the same as in other Brutes. But the † *scutiformis* here was not one entire Cartilage but two separated from one another, by the interposition of the Basis of the *Epiglottis*, running up the sides of it pretty broad, and sending down a narrower process to the Ex-

(f) *Rond. de Pisc. l. 3. cap. 9.*

treem of the *Annularis*. The *Cartilago Arytainoides*, (t) *Casterius* faith, is difficult to describe, *presertim cum pro diversitate subjectorum, eam quoq; variari ut plurimum contingat*; but in none, as hitherto I have observed, more than in this. For 'tis || protuberating beyond the *Annularis*, above an Inch and $\frac{3}{4}$. 'Tis two distinct Cartilages, joyned together by a strong membrane. At the end it has † thick lips, and in the middle a † *Rimula* which (u) *Vesalius* makes to be the *Glottis*, though those that make here five Cartilages do reckon this to make up the number. The * *Epiglottis* was no less remarkable, and its structure as different. 'Twas about two Inches in length, large at its *basis*, and fastened to the narrow part of the *Annularis*. As it ascends it becomes narrower, having its sides more closed together. At its extream it hath a large thick semicircular lip which serves to cover the *Rimula* or *Glottis*, though not protuberating much over it as in other Animals. The various Muscles that did serve to govern the Motion of these Cartilages were no less admirable and curiously contrived. But in this single subject we had not leasure to go through with them, being more intent upon the *Viscera*. We observed the *Glandule Thyroideæ* to be pretty large.

|| c c.

†† Tab. 1.
Fig. 4. a.

* Tab. 1.
fig. 5. DDD.

† Tab. 1.
Fig. 2. B.

The † *Os Hyoides* was very large and curious: and although *Dan. Major* hath mentioned an *Os Hyoideum reduplicatum*, yet I find he hath committed a double mistake concerning it; for it consisting as it were of two parts, the one he makes, I know not how, the *Os sterni*, the other the *Clavicule*. The first, which in his figure he gives us for the *Os sterni*, and said consisted of three Bones, in ours it was but one, but was of the figure he hath well expressed it in, *viz.* triangular or having 3 Processes, 2 whereof were two inches long, and in some parts about $\frac{3}{4}$ of an Inch broad, and had their extremities distant from one another about three Inches. The third Process was

(t) *Jul. Casterius Placentin. de Vocis Auditiſq; organis, l. 1. c. 10.*
(u) *And. Vesalius Corp. human. fabrica. l. 1. c. 38.*

much ſhorter, but from it there did ariſe two large Cartilages, which after a little while being reflected, had joyned to them two narrow Bones, which were three inches long and bended like Ribs. Theſe laſt I ſuppoſe Major took for the *Clavicula*, although (w) *Rondeletius* ſaith that Dolphins have no *Clavicula*, nor did I meet with any in this fiſh.

In the lower *Maxilla* there was a large Cavity filled with a ſubſtance that reſembled a Glandulous body or rather fat, different from that of the reſt of the body, and conſiſting of ſeveral little bodies orderly placed together, more ſhining and leſs fluid. Since the diſſection this part hath made me think of the *Sperma Ceti*, which is ſaid to be found in the head of a ſort of *Burmudas* Whale; but ſince by other Relations 'tis rendred dubious whether there might not from other parts likewise be obtained the ſame tallowy fat we call *Sperma Ceti*, or at leaſt being ignorant in what particular part in the head it is, that this does lye, it has ſtified a conjecture, whether poſſibly this might not be ſomething analogous to that in Whales, ſince a Porpeſs is of the Cetaceous Kind and hath ſo many parts the ſame and common to both, as eſpecially what we ſhall deſcribe next, the *Spiraculum*, *Fiſtula* or *Spout*.

The *Pipe* or *Spout* in this fiſh is its Noſtrils, and ſerves for the conveyance of Air in Reſpiration, as the *Nares* in other Animals: But hath alſo this additional uſe, for the ſpouting out of water, which when with its prey it receives in a great Quantity not convenient to be ſwallowed, and having no Gills, it may be ſent out this way without hazard of loſing what it had taken. Its contrivance is very curious, ariſing from the Palate with a ſingle *foramen*, but when it perforates the *Cranium*, 'tis divided by an oſſeous *ſeptum* into two, but above

|| *Tab. 2.*
Fig. x. aa.

† Tab. 2.
fig. 9. A.

it is united again into one, making in the skin a kind of † semilunar slit or *foramen*. At the lower Orifice as also above the *Cranium* it had several strong and fair muscles; which doubtless served for the regulating its motions in spouting out the water. In the inside of the *fistula* below the *septum* there were abundance of holes or *Papillæ* which I took for the Orifices of Glands, and Mr. Ray does observe that if you do press them, there would start out a certain glutinous liquor: Which *Mucus* may serve for the lubricating the insides of the *fistula*, as also defending them from the acrimony of the salt water, and may be likewise acrement cast off from the blood as is the snot in other Animals. Over the two hollows of

* Tab. 2.
Fig. 8. CC.

the *fistula* just above the *Cranium* there lye two * protuberating bodies like an *Epiglottis* or Valves, which as Mr. Ray does likewise observe, serve to stop the Pipe that no water gets in there without the fishes will. Near this there are placed four Bags or two pair of them: The first || pair which is the largest, lyes upon the middle of the

|| Tab. 2.
Fig. 9. BB.
and fig. 8.
DD.

* Fig. 8. E.

Rostrum or snout, it hath at first one common * *foramen*, then subdivides into two cells, each of which will contain a large Nutmeg; they are covered on the inside with a black skin, and seem to be made up of a gristly substance, formed into several *Plicæ* or folds lengthways, something resembling the *os spongiosum* in some other Animals, and possibly may have something of the same use, at least may serve for the forming the noise they make against storms

† Fig. 8. FF.

and bad weather. The two other or † second pair are placed higher and more to the sides of the *Rostrum*; their cavity is not so large, but in it is contained a considerable

|| G G.

|| Glandule about the bigness of a Filbird, which may separate a liquor serving to some of the uses before described. By having this membrane over it, it in part resembled the *Tonsils*. Mr. Ray mentioneth a third pair tending towards the brain, having a long but narrow passage, for the use as he conjectured of smelling; but opening the Brain, neither of us could find either Olfactory Nerves or *Processus Mamillares*. This last pair I

did

did not take notice of my self, though I do not deny but that they may be there.

Rondeletius denies that fishes have *Eye-lids*, where he saith, (x) *Palpebris verò omnes (sc. Pisces) carent, quòd commodè nictare in Aqua non possunt, sed duriores Oculi facti, nè faciliè ab Aquæ salsedine, quæ arrodit, lederentur.* And elsewhere, *Palpebrarum defectum Corneæ duritiæ pensavit Natura, quæ undiq; Oculum ambit, non ex adverso Papillæ tantum ut in hominibus.* Which though true in several fishes, yet holds not good in this, for here we must grant *Palpebra* or *Eye-lids*. Their aperture was but small, and on the insides of the upper *Eye-lid* we observed *Steno's ductus's* very fair, and did put in Bristles into several of them, that did run into the *Glandula innominata*, from whence they did arise, which Gland was very large. *Jonston* out of *Cardan* affirms that a Porpoise sometimes weeps; if there be a Passion, there wants not matter here for tears. However this humour may serve for the washing off the Brine of the Sea water from fretting the *Eye*, which in this hot Animal perhaps may be tenderer than in other fishes, which have for this use a proper *Tunicle*, which is a continuation of the *Cutis* that covers the *Cornea* and is transparent, as is plain in *Whitings*, &c. The *Orbit* of the *Eye* was not so perfect or composed of bones as in other Animals, but at the lower part it had only a very thin small bone. The Bulk of the *Eye* in proportion to the body was but small, being not so big as in a Sheep. It had all the Muscles very fair as in a Man, and likewise the *Musculus septimus* or *suspensorius* that is proper to Brutes, and which did inclose the Optick Nerve. The use of this in Brutes that are *prono Capite*, is thought to be, to suspend the Bulk of the *Eye* that it receives no injury from the declivity of the head; but there being not that danger here, Nature that does nothing in vain, must have some other intendments, and probably

(x) *Rond. de Pisc. l. 3. c. 2. p. 47.*

it may be, that by its equal contraction of the *Sclerotis* to which 'tis fastened, it renders the Ball of the Eye more or less spherical, and so fitter for vision. The *Tunica sclerotica* was much more dense and hard than in other Animals. The *Choroides* was party-coloured, a mixture of Blue and Green, which is not in the *Porcus terrestris*. The *Pupil* was Oval which is not so common in other fishes. The *Crystalline Humor* was of a Spherical figure, but seemed to be a little more convex in the anterior than posterior part. The *Optick Nerve* was not inserted so laterally as in Quadrupeds, but rather in *Axe Oculi*.

The *Brain* in this fish was large, it weighed $\text{xvi} \frac{1}{2}$ and resembled much more that of Quadrupeds than fishes. Its figure was somewhat short, but what it wanted in length, it had in breadth. The *Cerebrum* was separated from the *Cerebellum* by an *os triangulare*, as in Dogs and some other Animals. The *Brain* was divided into two Hemispheres, though *Rondeletius* does say that in a Dolphin 'tis not divided into *dextrum & sinistrum*. It had its *Anfractus*, but not so deep as in some. Its surface was curiously ramified with blood-vessels. There were the *sinus's* and *dura* and *pia Mater*, the *substantia Corticalis & Medullaris*; Nor in any thing was it more different from the usual make and conformation of it in other Animals than in the defect of the Olfactory Nerves and *Processus Mamillares*, which is likewise taken notice of by Mr. Ray. But for all this (y) *Rondeletius* thinks they smell, where he saith, *In Delphinis nec foramen (Narium) nec meatus ullus est, etiamsi sagacissime odorentur, ut testis est Aristot. (Hist. Anim. c. 8.) & Experientia ipsa confirmat*. The Optick Nerves were large, and did seem to be united as in men, and not so plainly to decussate each other as is usual in some fishes. We observed the *Nervi Oculorum motorii, Pathetici, &c.* in all about eight or nine Pair. The *Infundibulum* and *Glandula Pituitaria* were

(y) *Rondel. de Pisc. l. 3. cap. 8. p. 57.*

very fair. How the *Glandula Pinealis* was, we did not well observe, it being most decayed, as we supposed by keeping. But the *Tunica Choroides* did spread its self in both ventricles, and being united on the *Medulla Oblongata*, did run down the length of above half an Inch; 'twas the breadth of a Goose-quill, and did seem thicker than usual, and was a curious contexture of blood-vessels. As for the inward parts of the Brain we did observe all as delineated in Dr. *Willis's* figures; and though Mr. *Ray* does say that he did not observe in that which he dissected, those Protuberances call'd *Nates* and *Testes*, yet we saw them both very fair, but the *Testes* were much larger than the *Nates*. The *substantia Medullaris* in the *Cerebellum* was very Curious and ramified like Ferne. From the *Medulla Spinalis* upwards the *Cerebellum* was flatter and less protuberant than in other Animals. The *Medulla Spinalis* was covered, as is related before, with a thick Glandulous, or at least vascular Tunicle, it sends forth abundance of Nerves, and at length makes a large *Cauda Equina*.

Mr. *Ray* saith that the largeness of the Brain in this fish, and the Correspondence of it to that of a Man's, argues this Creature to be of a more than ordinary Wit and Capacity, and makes to seem less fabulous and improbable those antient stories related by *Herodotus* concerning *Arion*, by (a) *Pliny* the Elder concerning a Dolphin enamoured of a Boy, whom he was wont to carry cross a Bay of the Sea from *Baie* to *Puteoli* to School, and by (b) *Pliny* the younger of another enamoured of a Boy at *Hippo* in *Africa*, whom he was wont to carry on his back in like manner. (c) *Pausanias* has a like story, and (d) *Plutarch* relates how *Eualus* was saved by Dolphins in like manner as *Arion*. *Dio Chrysostom* not only relates the story of *Arion*, but adds that the Mariners were executed, and *Jo. Scaliger* in *Animad.*

(a) *Plin. Hist. Nat. lib. 9. c. 8.* (b) *Plin. Epist. 33. lib. 9.*
(c) *Pausan. in Laconic.* (d) *Plutarch. in Sympos.*

in *Euseb.* p. 84. does assert it to be no fable but a true History. But (f) *A. Gellius* makes it to be an Imposture of *Herodotus*, as also does (g) *Strabo*. And considering the Lubricity of the skin of this fish, the protuberancy of its back, and its undulating not horizontal motion in swimming, it does confirm their Censure,

—*sed quid non Græcia mendax
Audet in Historia?*

However *Severinus* (in his *Phoca illustratus*, p. m. 27.) relates out of *Fran. Lopes* (*Hist. Indica General. cap. 31.*) that a *Manatus* or sort of Sea-calf was kept in a Lake in *Hispaniola* that was grown very tame, and did use to carry on his back from one side of the Lake to the other ten boyes at once.

Aristotle (i) grants that Dolphins hear, but saith, they have no Ears; (k) *Pliny* writes the same, but we rather concur with *Rondeletius*, (l) *sed ista ex dissectione falsa apparent; meatus enim audiendi in Delphino hujusmodi comperiuntur, quales ad sonos percipiendos idonei esse possunt.* 'Tis true they have no *Auricula*, which though they would advantage their hearing, yet would injure their swimming; and the *Porus Auditorius* is extream minute and small, for if larger, the water getting into it, might likewise prove an Inconvenience. But the structure of the Organ of the Ear, or the Os * *Petrosum* in this Animal is very remarkable, and different from any that I know yet described. 'Tis seated in a large cavity of the *Cranium*, but not locked in by futures or the joyning of the other Bones, but fastened chiefly by the intervention of Muscles: 'Tis the hardest bone in the body, its colour white, its figure irregular, and difficult to be described

* Tab. 2.
Fig. 12.

(f) *A. Gellius Noct. Artic. l. 16. c. 19.* (g) *Strabo l. 13.*
(i) *Arist. Hist. Anim. l. 1. c. 11.* (k) *Pliny Hist. Nat. l. 11. c. 37.*
(l) *Rond. de Pisc. l. 3. c. 3. p. 50.*

by words. As fixed in the *Cranium* you may observe in its surface a winding † *Sinus* or furrow that leads to the † *Tab. 2.*
 † *Tympanum* that is placed a little within the bone. At † *Fig. 12. 2.*
 the *Processus Mamillaris* it has three large Protuberances † *B.*
 or *Processus*, and at its opposite extremity inwards a hollow,
 which is better perceived when the bone is taken out,
 for then you may observe a large * Cavity that leads in- † *Fig. 13. C.*
 to the Hollows of the Ear-bone, besides several other *for-*
amina's that afford passages to the Nerves or some small
 muscles; so that the Ear here is not a continued and en-
 tire bone forming a Cavity within its self, but at its in-
 ward part where joyned to the *Cranium* 'tis perfectly di-
 vided and seems to make two bones, being joyned toge-
 ther only at its anterior part, where is the *Tympanum*.
 Sawing it there asunder, one part of the bone somewhat
 resembled a sort of *Concha Veneris*, and at one place was
 very † thick and solid, the other was a thinner *Lamina* † *Fig. 13.*
 making the Cavity; the other part of the bone was like- *dd.*
 wise very thick, having three large Protuberances, the
 middlemost which was opposite to the *Tympanum* at its
 outside, had a large † *foramen*, which afterwards divided † *B.*
 into others; here we supposed the Auditory Nerve en-
 tered. This bone by its winding somewhat resembled
 a * *Cochlea*, and at its inside opposite to the *Tympanum* * *a. a.*
 there went several fibres or small minute Muscles, which
 by their contraction and keeping this membrane tense,
 might perform their Office and supply their defect, Na-
 ture never being wanting of means for the attaining her
 end, though not alwayes making use of the same. So
 possibly it is that since there is so open a Cavity at its
 posterior part, it has made the bones there so thick and
 dense, that the sound may be more intense from the grea-
 ter Collision of the Air on so solid a body. Where
 there were a design of giving the Comparative Anatomy
 of the Organ of this Sense in various Animals, this
 may well deserve a stricter inquiry into. *Dan. Major*
 hath given two Figures of this bone, but without its ex-
 planation.

There

There remains the *Osteology*, or to give an account of the *Bones* and *Skeleton* of this fish, and in general I shall observe of them, that as the *Muscles* and most of the *Viscera* very much imitated the structure of those of *Quadrupeds*, so likewise the *Bones* here came very near them, as to their solidity, colour and structure, and in all excepting what differences the necessity of the figure of this fish occasioned. I shall begin with those of the Head, where I shall take notice of the *Cranium*, the *Rostrum* and lower Jaw or *Maxilla*. For where (m) *Rondeletius* saith, a *Phocæna* has no *Rostrum*, it must be understood of its appearing so whil'st the flesh and fat is on; whose great bulk does render it obtuse and curt: but when 'tis taken off it appears otherwise; for then the upper Jaw or *Rostrum* from the *Cranium* to its Extremity is six inches long, but in a Dolphin much longer. At the beginning of this bone just below the *Cranium* is the *Fistula* or * *Nares*, which as is related before was divided by an osseous *septum* into two Cavities. The *fistula* was formed partly by that bone *Columbus* calls the *Vomer*, which arising from the Palate does send a thin *Lamina* up the *Cranium*, and is continued on the *os frontis* to the great Protuberance in the middle there, forming three † protuberances on the *os frontis* above the *fistula*. The other part of the *fistula* is formed by two bones, pretty large at their basis and rising above the surface of the *Rostrum*, and sending down two ‖ *Pyramidal* processes about two inches long, between the inward bones of the *Rostrum*. For the *Rostrum* was composed of four Bones, the two * outwardmost were a continuation of those of the *Cranium* having two processes, the first that composed part of the ‖ *os Zygomaticum*, and another about two inches lower; then it grew narrower, not being almost half the breadth as it was before. To be too nice and scrupulous in the description of all the bones here might seem tedious and

* Tab. 2.
Fig. x. aa.

† B.

‖ c. c.

* d.

‖ f.

44 Phocæna, or the Anatomy of a Porpoise.

troublesome ; I shall therefore take notice only of the most remarkable things : as whereas the *Cranium* was five inches in breadth, 'twas only three in length. 'Twas protuberant much above the † *Rostrum*. The futures † at B. chiefly were those they call *Harmonie*, by a simple line, but the *Lambdaïdea* was somewhat indented.

By reason of the different bones that composed the *Cranium* the futures likewise were differently placed. But I observed that where I might expect the *sutura Coronalis* there was a large eminency of the * bones, and just * C. in the middle of the forehead over the *fistula* there was a large Protuberancy jutting out. Other particularities I might take notice of here as also in the Palate : but passing them aside, within the *Cranium* we found an *os triangulare*, but somewhat different from that in Dogs, having at its extremity a rising up like a *Crista Galli*. From this bone the length of the upper part of the *Cranium* answering to the *sinus Longitudinalis*, there was a pretty deep Protuberancy, that as the *os triangulare* separated the *Cerebrum* and *Cerebellum*, this did the two Hemispheres of the Brain. I observed no *Crista Galli* here, and the *os Cribriforme* was not perforated, as is usual. The Anterior Processes of the *sella Turcica* were wanting, though there were somewhat of the Posterior ; but there were not those *foramina*'s from it as in a mans, and other Brutes ; though it had an *Infundibulum* and *Glandula Pituitaria*. That part of the Ear-bone or *os Petrosum* which I said resembled a * *Cochlea* from its winding, * Tab. 2. does on the inside here appear very well, and that passage Fig. 13. A. for the auditory nerve is very fair. The Cavity for this bone is large, but a great part of it filled with Muscles.

Dan. Major has given a figure of the *Cranium*, but in some particulars he does not sufficiently express the life ; but that which he gives of part of the lower *Maxilla* is more exact. It was a † thin but solid bone ; its *Lamina* on † Tab. 2. the inside was not continued home to the Articulation, Fig. x. K. but leaving a large space, that led into a considerable Cavity

vity within, which was filled with a particular sort of fatty substance, as is before hinted. The length of the lower *Maxilla* or Jaw was about 7 Inches and $\frac{1}{2}$ at the broadest place, towards the articulation two Inches; and in the narrowest towards the extream, not above an Inch. It consisted of two bones that were joyned together at the *Mentum*.

We shall next describe the *Spine* which consisted of sixty *Vertebrae* from the † *Atlas* to the *apex* of the *Tayle*. *Dán*. Major numbred but fifty four, the first or the *Atlas* to which the *Cranium* was fastened, was very large, having two transverse Processes that were long, and two others just below them that were much shorter and lesser. It had likewise two Spinal Processes: The hindermost that was much the greatest answering to the Spinal Processes of the other *Vertebrae*, and a smaller jutting something towards the head. This hindermost Spinal Process, at its extremity had a division, that it might receive the Spinal process of the next *Vertebra*; which seem providently contrived, that so it might not hinder the erection or flection backwards of the head. Under this first *Vertebra* there was the appearance of two other small ones, which may be reckoned those of the Neck. The *Vertebrae* of the *Thorax*, as also the *Abdomen*, had transverse, spinal and oblique processes; but those of the upper *Vertebrae* were smaller than of the lower, all being largest about the beginning of the *Abdomen*. In the first six *Vertebrae* the Posterior Spinal process, upon flection of the body, is received into the Cavity of the Anterior; but in the other *Vertebrae* that of the Anterior into the Posterior; but the seventh *Vertebra* seems dubious between both. So the transverse or lateral processes of the *Vertebrae* of the *Thorax* are oblique descending. The four first of the *Abdomen* do lye at right angles with the *Vertebrae*; but the remaining are obliquely ascending. The oblique Processes in the first *Vertebrae* of the *Thorax* seem to be *Epiphyses* of the transverse, but as they do descend, they

they grow gradually higher and higher on the Spinal, forming two cheeks, into which is received the back of the anterior spinal process.

Besides these processes already mentioned below the *Abdomen* and opposite to the spinal processes, I find * others not arising from the *vertebrae* themselves, but † *Fig. 2.* that Cartilaginous body that joyns the *vertebrae* together. ^{P P.} They consist of two small bones joyned together at the end, but distant at the bases, so occasioning a hollow, through which there runs abundance of blood-vessels; as the *Medulla Spinalis* does in the Cavity of the Spinal processes. These processes, as do all the other, grow lesser as they approach the Tayle till they are quite obliterated. Where the Tayle or hinderfins are fastened, the *vertebrae* do proportionably lessen and do grow broader and less round. The *vertebrae* are joyned together by the intervention of a bony Cartilaginous body that consists of a double *Lamina*, containing, in a Cavity in the Middle, a gellied substance. This is an excellent contrivance for the flexion of the body, for otherwise the *vertebrae* themselves are too rigid for such a motion.

I have before mentioned that there were thirteen † *Ribs*, that only five were fastened to the *Sternum*, that † s s s. the sixth and seventh had Cartilages but not continued to the *sternum*; how that they rose obliquely from the Spine, &c. I shall add that the first five *Ribs*, that were continued to the Spine, had a double origination; the first to the extremity of the transverse process of a hinder *vertebra*, and the second to the basis of a former. The other *Ribs* were only fastened to the extremity of the transverse or Lateral Processes. The thirteenth or last Rib did arise only with a Cartilaginous Origination, and afterwards became long. And whereas the *os Pectoris* or *Sternum*, and that which continues the *Ribs* in other Animals to the *sternum*, is usually Cartilages, here 'twas all perfect bones.

¶ Tab. 1.
Fig. 2. d.

The ¶ *Sternum* here was one entire bone, four Inches and $\frac{1}{2}$ long; about three and $\frac{1}{2}$ broad at the upper end, but towards the lower part, it was but one Inch. It had no *Cartilago ensi-* or *scutiformis*, that I observed. At the broad end 'twas somewhat depressed, and in the middle had a perforation; both which I suppose were for the better adhesion of Muscles. *Dan. Major* not taking notice of this, describes part of the *os Hyoides* for the *os Sterni* as is mentioned before.

* Tab. 2.
Fig. 11. A.
† B.
¶ C.
* d d.

'Tis before remarked how much the *Fore-fins* resembled an Arm, consisting of Bones and Cartilages curiously articulated together. The *Os* * *Humeri* or *Brachii* was about one Inch and $\frac{3}{4}$ long. The † *Radius* and ¶ *Ulna* about two Inches, but the *Radius* towards the *Carpe* was an Inch broad. The * *Carpus* seemed to consist of five pretty large roundish bones, joyned by Cartilages, and two oblong ones that seemed the *Epiphyses* of the *Radius* and *Ulna*. After this 'twas divided into five fingers, but the Thumb and little finger were very short. The fore-finger was the longest, then the middle-finger, and so the third. These three last mentioned fingers had the bones of the ¶ *Metacarpus*. The fore-finger had five † *Articuli* or Joynts, and so the middle finger; but the third had but three. Between the bones of each *Articulus* there were very large Cartilages that seemed double, one belonging to the extrems of each bone. *Major* hath given a figure of the whole Arm or Fin; (n) *Bartholine* hath a like picture of the hand of a Syren, and such an one there is likewise in *Septalius* his *Museum*; as there is also kept in the Anatomy School at *Oxon*.

* Tab. 2.
Fig. x. Q.

The * *Scapula* to which was fastened the *os Humeri*, was pretty large, much of the usual figure of that of

48 Phocæna, or the Anatomy of a Porpoess.

Whales which is commonly made use of for Signs. It wanted the Spine and had two large || procelles, || *Fig.x. p.* which is best understood by the Cut, as 'tis well represented by *Dan. Major*.

As to the *Myology* we have little to add, not having had leasure to prosecute that in this subject; however I shall observe that the *Musculus Psoas* was very large, lying on each side the Spine, and having one extreame inserted in the *Thorax* and the other by strong tendons in the Tayle. Likewise on the Back between the Spinal and transverse Procelles there did lye two very thick Muscles, rising from the *os Occipitis* and terminating with a multitude of tendons in the Tayle, but sending tendons all along to the Spinal *vertebrae*, &c. These Muscles doubtless contribute very much to their swift and nimble motion, which as it hath been observed by many, so is elegantly expressed by *Ovid*, where he saith,

*Undiq; dant saltus, multaq; aspergine rorant,
Emerguntq; iterum, redeuntq; sub aquora rursus,
Inq; Chori ludunt speciem, lascivâq; jactant
Corpora, & acceptum patulis mare naribus efflant.*

F I N I S.

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At a Meeting of the Council of the Royal Society,
Decemb. 8th 1680.

Ordered, That a Book intitled A New Di-
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Written by Dr. Robert Boyle, Doctor of Physick, and
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At a Meeting of the Council of the Royal Society,
Decemb. 8th 1680.

ORdered, That a Book intituled *A New Digester, or Engine for softning Bones, &c.* Written by *Denys Papin* Doctor of Physick, and Fellow of this Society, be Printed and Published.

Chr. Wren.



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